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Discoloration in canned lobsters

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DISCOLORATION IN CANNED LOBSTERS.

By

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INTRODUCTION.

Of the annual output of the lobster canneries of the Maritime Provinces, a large number of the cans are found immediately or ultimately with the contents darkened or blackened, and the inner surface of the tin in such cans is covered wholly or in part with a rust like deposit. To what this discoloration is due has been variously explained but almost wholly as of purely chemical origin, yet the explanations advanced have not in the slightest degree assisted in suggesting measures to prevent discoloration. Recently it has been found that the affected cans examined had in every instance a bacterial flora which the unaffected cans did not have. Whether a generalization as to the cause of the discoloration may be drawn from these results must be determined after further extended investigation. If the causation should definitely prove to be bacterial in character, the measures to be taken to counteract it would be comparatively simple and would involve only thorough sterilization of the cans after they are hermetically sealed.

That there are other factors involved is not yet wholly excluded. The discoloration of the contents of the

cans is accompanied, though not always, by a discoloration or rust like incrustation of the internal surface of the cans. As this discoloration of the tin, so far as present observations go, never appears without a discoloration of the contents, it would appear as if it were due to the effect on the tin of products of the action of bacteria on the contents, but the fact that in some of the spoiled tins there is no incrustation indicates either that the bacteria concerned are not all of the same species, or that the surface of the tin plate used in making the cans varies greatly in its capacity to resist chemical action. That there is a variety in this respect in the tin plate used seems to be indicated by the results of recent investigation, but whether this generalization can be applied to the tin plate used in the canning of lobsters can only be determined by special investigation.

As the lobster canning industry is one of considerable importance to Canada and as its success depends on a high grade of product, a thorough and prolonged research on the problems affecting the industry has been planned and carried out.

This investigation was conducted under the direction of Dr. F.C. Harrison, Principal of the School of Agriculture, and Professor of Bacteriology, Macdonald College, McGill University. The investigations were made under the auspices of the Honorary Advisory Council for Scientific and Industrial Research of Canada, and under a grant from the Dominion Government, set aside for research work on the chemistry and bacteriology of fish and its products.

EXTENT AND VALUE OF THE INDUSTRY

The extent and value of the lobster industry of Canada is shown by the following figures obtained from the Deputy Minister of the Department of Marine and Fisheries, Ottawa:-

	No.of cases canned	Equivalent No. of 1 lb. cans	Shipped fresh No. of cwts.	Value
1915	162,966	7,822,368	119,599	$ 4,506,155
1916	197,751	9,492,048	84,992	5,508.054
1917	195,993	9,407,664	84,569	5,654,265
1918	107,812	5,174,976	59,251	3,531,104
1919	128,759	6,180,432	85,340	5,320,816
1920	173,825	8,338,583	116,209	6,183,102

It is a matter of exceeding difficulty to estimate accurately the annual loss sustained by the industry through deterioration in the quality of the goods, by blackening and other causes, because the loss falls in so many directions.

First, there is a loss to the individual packer; then to the buyer, the wholesale merchant, to the retail dealer, and finally to the consumer who probably bears the bulk of it, and whose loss can never be ascertained. It has, however, been roughly estimated by some of the larger packers that the loss must exceed upward of a million dollars annually.

LICENSED FACTORIES.

For the season of 1919-20 the number of licenses granted to lobster packers in Prince Edward Island, New Brunswick and Nova Scotia totalled 394. The number of factories protected by these licenses totalled 460. In New Brunswick one company operated 15 canneries, and throughout Prince Edward Island and Nova Scotia a number of companies operated varying numbers, from 2 to 10. The distribution was as follows:-

	Licenses	Factories
Prince Edward Island	151	166
New Brunswick	131	158
Nova Scotia	112	136

During June, 1920, a number of factories were visited in New Brunswick for the purpose of accumulating data relative to cannery methods, processing, etc. After visiting a number of factories, it was very soon determined that a wide range of variation existed in the methods employed.

Description of Factory Methods.

In order to understand how deterioration might come about, it seems necessary that a short description of the methods employed in the lobster packing industry should be given. It should be said in the outset that those engaged in the industry are using their best efforts to secure satisfactory results, and that any failure is due to causes entirely beyond their knowledge, and all those with whom I came in contact

showed a disposition to do everything in their power to forward the investigation. At the same time, in many cases the wonder is not that the canned product is so bad, but that it is as good as it really is. Many of the factories are mere hovels with inadequate appliances for ordinary cleanliness, and under the best conditions it is to be remembered that the quantity and kind of offal connected with the process is admirably suited for the growth of putrefactive micro-organisms. The factories are situated upon the shore with stages leading into deep water for the accommodation of boats, or the buildings themselves are at the end of a stage connecting with the shore. Here the boats come laden with lobsters from the traps. They are shovelled into casks, weighed, and at once dumped into a vat of boiling water. The time of boiling is usually seven to ten minutes, depending upon the size of the lobsters. They are then thrown upon large tables to cool, and when cool are "broken off", that is, the tail is broken from the body, and the claws removed and placed in separate wire baskets.

The tails are taken to the "tail table" and the meat either "punched" or pulled. That is, either pushed out from behind or pulled out in front with a fork. The latter method is preferable, as otherwise the last segment of the tail may be broken off. The claws are cracked with a suitable knife and the meat shaken out; the arms are split longitudinally and the "arm meat" pulled out with a suitable knife. The tails are next split and the gut removed. This splitting may be done upon the "front" or back. Front splitting is preferable since it does

not interfere with the contour of the body. The blood which has coagulated in the claws in boiling is removed by washing in sea water, and the tails are cleaned in the same way, care being taken to remove as much of the "green gland" or liver as possible, which in boiling has tinged the upper part of the tail. The meat is placed in strainers, washed two or three times, and is then ready to pack. Two sizes of cans are employed: quarter and half pound sanitary cans. From reports of the 1920 questionnaire, 93 percent of the packers used parchment linings. However, many have done away with this and are now using the lacquered or enamel sanitary can. The tails are curled up and placed in the bottom; then comes a little arm meat and the claws are laid in rows on top. Where sea water is used for pickle, 2 or 3 percent of salt is added; where fresh water is used as high as 8 percent is often added. The standard amount of pickle for the quarters and halves is one half and one ounce respectively. The cans are sealed by power machines. They are then placed in shallow pans, in rows, end to end, immersed in boiling water for $2\frac{1}{2}$ to 3 hours, depending upon the size of the can. On removal from the bath the cans are allowed to air cool, and are packed in cases for shipping.

Figures I to I2 Illustrate Methods Employed in the Lobster Industry.

Fig. I.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. II.

Fig. 12.

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In order then to ascertain if such conditions prevailed throughout the industry, a questionnaire was formulated and submitted to all licensed canneries. The questionnaire comprised the following points of inquiry.

QUESTIONNAIRE

1. Are your lobsters obtained on rock bottom?
2. Do you obtain your lobsters from muddy or sandy bottom?
3. Do you keep lobsters in cars?
4. Do you can any lobsters in the cars?
5. What is the average time of boiling in the car?
6. Is the vessel in which you boil wood, iron or cement?
7. Are the tables on which the meat is taken out of wood or metal?
8. What kind of can do you use, lacquered, sanitary or other form?
9. Do you wash the cans before using them?
10. Do you use paper linings?
11. What kind of salt do you use?
12. What is the source of your fresh water supply?
13. How do you close the cans?
14. Do you use resin, flux or liquid?
15. Do you brogue?
16. What is the average time between filling the can and cooking?
17. How long do you boil before brogueing?

18. How long do you boil after brogueing?

19. What is the source of your heat - steam, hot water, pressure?

20. How many times do you heat?

21. What is the length of time for each heating?

22. How do you cool the cans?

23. How long are the cans held in the storeroom and at what temperature?

Discoloration.

1. Have you had discoloration or smut in your factory during your experience in packing?

2. Does it occur at any particular time of the season?

3. Have you used more than one kind of can?

4. Do you notice any difference or advantage in one form of can over another as regards discoloration?

5. Have you any explanation as to the cause of discoloration or smut?

Name............................

Situation of Cannery..............

P.O. Address......................

The Scientific and Industrial Research Council have asked me to investigate the cause of discoloration in lobsters. In order to do this we need the co-operation and help of all engaged in packing lobsters. We wish to be at the service of those canning lobsters, and by answering the following questions, it will aid materially in helping us to arrive at some solution of the spoiling known as "discoloration" or "smut".

SUMMARY OF QUESTIONNAIRE

The following data were compiled from 118 returned questionnaires, representing factories in Nova Scotia, Prince Edward Island and New Brunswick. For convenience of comparison, percentage figures are given throughout the summary.

Question.

1. 51 percent of the lobsters canned in Nova Scotia, New Brunswick and Prince Edward Island were trapped on rock bottom.
2. 26 percent were trapped on a rock, sand and mud bottom, 21 percent on a rock and sand bott om, and 2 percent from sand alone.
3. 23 percent answer yes.
4. 12 percent answer yes.
5. Of t he 12 percent who practise boiling lobster in the cars, their results were as follows:-

Minimum time of boiling			-	5 minutes	
Maximum	"	"	"	-	30 "
Average	"	"	"	-	14 "

6. Boiling vessels were as follows:-

74 percent used vessels of galvanized iron,
19 " " " " wood,
4 " " " " copper,
2 " " " " zinc,
1 " " " " cement.

Question.

7. Factory tables were as follows:-

93	percent used tables of galvanized iron,	
9	" " " " zinc,	
3	" " " " wood.	

8. Kinds of cans were as follows:-

76	percent used plain sanitary cans,
7	" " lacquered " "
17	" " old-form-solder "

9. 37 percent washed cans before using,
54 " did not wash cans before using,
9 " washed cans when considered necessary.

10. 93 percent used parchment linings
These were used in all cans, except in sanitary lacquered cans.

11. 60 percent used fine table salt.
20 " " coarse salt
17 " " Liverpool.
3 " " sea water.

12. 65 percent of water was received from wells.
13 " " " " " " springs.
10 " " " " " " sea.
9 " " " " " " streams
2 " " " " " " lakes.
1 " " " " " " ponds.

Question.

13. 83 percent were machine closed.
17 " " hand "

14. Of the 17 percent hand closed cans
9 percent used liquid for soldering,
5 " " flux " "
3 " " resin " "

15. 74 percent of canners practised brogueing.

16. The minimum time between filling cans and cooking was reported as immediate.
The maximum time was four hours.
The average " " $1\frac{1}{2}$ "
One canner reported 12 hours.

17. Minimum time of heating before brogueing - 20 minutes
Maximum " " " " " - 2 hours
Average " " " " " - $1\frac{1}{4}$ "

18. Minimum time of heating after brogueing - 1 hour
Maximum " " " " " - 3 "
Average " " " " " - $1\frac{1}{4}$ "
Minimum time of total heating where brogueing was practised - 2 hours.
Maximum time - $3\frac{1}{4}$ "
Average " - $2\frac{1}{2}$ "
Where no heat was applied after brogueing the minimum time of heating was 2 hours.
Maximum time - 3 hours.
Average " - $2\frac{1}{4}$ "

Question.

18. Where brogueing was not practised the minimum time
(Cont'd.)
of heating was 2 hours.

Maximum time - $3\frac{1}{4}$ hours.

Average " - 3 "

23 percent practised continuous heating

25 " applied no heat after brogueing.

50 " heated before and after brogueing

2 " did not brogue, but applied two heatings of one and a half hours each.

One factory reported a pressure cooker, with the following data:-

1 lb. cans - 45 minutes at 240°F.

$\frac{1}{2}$ and $\frac{1}{4}$ " " - 40 " " 240°F.

3 percent specified any difference in time of heating in relation to the size of the can.

19. 63 percent used open bath method.

36 " passed steam into water.

1 " used pressure.

20. 49 " practised heating once

50 " " " twice.

1 " " " by pressure

N.B. Where two heatings were given in no case was it reported as being given on different days.

21. See questions 17 and 18.

22. 48 percent practised cooling cans by water.

52 " " " " " air.

Question.

23. Cans were held at temperature of factory over varying periods of time, but no definite data was available.

Discoloration

1. 45 percent reported discoloration

   55 " " no discoloration.

2. 75 percent reported that season had no effect.

   25 " " as follows:-

   15 percent confined discoloration to the warm weather months, July and August.

   4 percent reported early May.

   3 " " fall months

   3 " " as seasonal.

3. 59 percent used more than one form of can.

   41 " did not.

4. 80 percent saw no advantage of one can over another.

   20 " reported as follows:-

   14 percent preferred sanitary can,

   4 " " " lacquered,

   1 " " hand sealed.

   1 " saw no difference providing tin plate was of equal quality.

5. Discoloration was reported by many canners to be due to a single factor. In many instances, however, discoloration was regarded as being of non-specific nature,

5. (Cont'd.)

and brought about only by a combination of two or more of the following advanced causes.

THEORIES ADVANCED AS TO THE CAUSE OF DISCOLORATION

1. Long exposure of lobster in shell before canning.
2. Chemical action between exposed iron of can and lobster.
3. Shelling and packing cold lobster.
4. Unsanitary conditions.
5. Long exposure in factory.
6. Delayed processing.
7. Poor tin plate.
8. Over boiling in shell.
9. Insufficient pickle.
10. Underboiling in shell.
11. Packing during July, August and early September.
12. Packing cold and sour meat.
13. Packing dead, partially dead or soft shell lobster.
14. Discoloration due to action of acid on iron.
15. Long exposure in traps.
16. Improper cooling of cans.
17. Underprocessing of cans.
18. Sanitary can too small.
19. Feeding habits and location of lobster.
20. Hot lobster packed with cold.
21. Chemical composition of lobster.

22. Excessive pickle.

23. Use of fresh water substitutes for sea water in pickle.

24. Lobster blood not thoroughly washed off.

DISCOLORED LOBSTER CANS.

Introduction.

During the last few seasons, considerable anxiety has developed among lobster packers regarding a discoloration that appears in the interior of the lobster container. This form of discoloration has been known to some for a number of years, and probably always existed more or less. Many packers, however, insist that the difficulty has become much greater during the last few years. It seems probable that certain seasons are more favorable than others. At the same time, the fact that it is observed now to a greater extent than before, would seem to indicate that it is probably due, in large part, to the increasing care of consumers, and especially of jobbers in the inspection of foods. To-day foods and the packages containing them are much more carefully scrutinized than ever before, and an unusual appearance, which formerly would have been overlooked, is now regarded with disfavor. While this condition is true within certain limitations, it should be borne in mind that, where discoloration occurs in lobster cans, the degree is so great that at no time would it have escaped detection. On the other hand, it must also be remembered that some canneries are producing at the present time lobsters free of even a trace of discoloration, while others are encountering the greatest difficulty under similar conditions of handling.

GENERAL APPEARANCE OF SPOILED CANS.

During the laboratory investigation the cans under observation have been classified according to the appearance of the contents and of the container.

1. Inky black discoloration of the meat.

2. Inky black discoloration of the can interior.

3. Blueing of the meat.

4. Brown incrustation of the can interior.

5. Brown discoloration of the paper.

6. Black discoloration of the paper.

7. Dull yellowish white appearance of the meat.

8. Varied other than blackening or browning; due to bacterial decomposition; manifested in many ways, as general decomposition resulting in a greenish and a yellowish discoloration of parts of the lobster meat and alteration of the pickle, producing turbidity without the production of color.

IS DISCOLORATION BACTERIAL?

As long ago as 1896, McPhail[1] made a detailed study of the causes which produce discoloration in lobster meat. He proved that the deterioration in color, odor, flavor and texture were "due in the main to putrefaction, and putrefaction to be due to the action of micro-organisms". Finally, he clearly indicated sterilization as a remedy.

McFarlane[2] has favored me with the following report of her work:-

"The blackened tins contained meat that had undergone decomposition, which was evident from the alkaline pungent odor of the meat and liquid. This was more pronounced in the older cans.

"Bacteria which might have been responsible for the decomposition were found in a number of the blackened cans, but not in all, and they were also found in a number of good cans. None were found in the recently packed cans.

"The blackening was produced experimentally in various tissues of the lobster's body under a variety of conditions; but the experiments were not extensive enough to show just what conditions are necessary to produce the blackening".

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[1] McPhail and Bruere. Discoloration in Canned Lobsters, Ottawa Supp. No. 2, 29 Annual Rept., Dept. Marine and Fisheries.

[2] McFarlane. Unpublished report.

Knight's[1] experiments indicate that the discoloration was due to the interaction of decomposing meat on the metals of the cans, that all of the cans had not been sufficiently sterilized by heating or had been kept sterile and that possibly some of the meat had begun decomposing before it was canned.

Prescott's and Underwood's[2] experiments conclude that discoloration was due to bacterial action, and could be overcome by proper methods of sterilization.

The writer has found in his experiments that 80 percent of the discoloration was chemical, and the remainder bacterial; the latter due to three causes:- (1) Bacterial action previous to canning; (2) Understerilization; (3) Leaks.

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[1] Knight - The Conditions in and around Twenty-three Lobster Canning Factories in Prince Edward Island and New Brunswick during the summer of 1920. Report of Biological Board of Canada, 1921.

[2] Prescott and Underwood. Micro-organisms and Sterilizing Processes in the Canning Industries. Technology Quarterly X., 1, P. 183-199.

ORGANISMS IN DISCOLORED AND NORMAL LOBSTER CANS.

Introduction.

Prescott and Underwood (1897)[1], working on cans of spoiled clams and lobsters, make the following statement:- "Spoiled cans are sometimes found in canned clams, and more frequently in lobster, on the latter they are known to the trade as "black lobster"."

Their investigation began with a careful examination of a large number of cans of spoiled clams and lobsters. The contents of such cans were found to be badly decomposed and, in some cases, liquified. In other cases, darkening and odors were present. Living bacteria were present in great numbers. The investigators isolated species of bacteria, two classed as micrococci, and seven as bacilli. Four of the organisms formed spores.

The following experiments are of interest:-

Inoculation Experiments.

No. of cans.	Treatment.	Incubation.	Results.
7	Punched not inoc.	37 1/2°C.	Perfect
5	" " "	"	"
5	" " "	"	"
16	Inoculated.	"	14 spoiled
3	"	"	all "
12	"	"	7 "
5	"	"	all "

All cans were sealed with solder.

1 Prescott and Underwood, 1897. Micro-organisms and Sterilizing Processes in the Canning Industries. Technology Quarterly X., 1, P. 183-199.

Efficiency of the Water Bath Treatment.

No.of cans.	Time of heating in hours.	Incubated.	Results.
7	1 - 1 - 1	$37\frac{1}{2}$°C.	All spoiled.
8	1 - $1\frac{1}{2}$	"	" "
7	1 - 1 - 1	20	" "
8	1 - $1\frac{1}{2}$	"	" "
16	$\frac{1}{2}$ - $\frac{1}{2}$ - $\frac{1}{2}$	$37\frac{1}{2}$°C.	14 "
8	$1\frac{1}{2}$ - $1\frac{1}{2}$	"	All "
3	$1\frac{1}{2}$ - $1\frac{1}{2}$	"	" "
3	1 - $1\frac{1}{2}$	"	2 "
63			58

In this experiment all cans were tapped between the two heatings and all heatings given on the same day as under factory conditions.

From these figures it is seen that 92 percent of the cans spoiled, a far greater percentage of loss than occurs in practice. This is accounted for by the large numbers of bacteria planted, together with an optimum temperature for bacterial growth.

Efficiency of Continuous Heating.

No.of cans.	Time of boiling in hours.	Results.
2	4	Spoiled in 48 hours.
3	5	2 " " 48 "
		1 " " 64 "
3	6	2 " " 48 "
		1 " " 64 "
3	7	2 " " 48 "
4	6	All spoiled.
4	7	" "
4	8	" "

These results indicate that the organismshere dealt with have very great resistance to heat, and that complete

sterilization cannot be accomplished by the continuous method.

Without experimental data, they report that out of one hundred cans heated in a retort, no spoilage occurred after one month's incubation at 37°C. No temperatures were stated.

McPhail associated with Bruere[1] (1897) in their work on lobsters isolated and recorded four strains of bacteria; two were cocci, and two were bacilli. None of the organisms formed spores. Each of the four were inoculated into sterile cans of lobster, and in due course the rules of proof were satisfied.

Methods.

On account of the lack of specific literature, and of descriptions of actual methods adopted in the isolation of bacteria from spoiled lobster cans, the procedure followed has largely been determined by experience as the work progressed.

Isolation of Bacteria from the Cans.

In the examination of both discolored and normal cans, the following procedure was adopted. Can openers and forceps were wrapped in paper and sterilized by dry heat. When a sufficiently large opening had been made in the can, pieces of lobster flesh and one c.c. of the liquor were removed with forceps and pipettes and inoculated into media.

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[1] McPhail and Bruere, 1897. Discoloration in Canned Lobsters, Ottawa Supp. No. 2, 29 Annual Rept., Dept. Marine and Fisheries.

Media Employed.

Inoculations were first made in duplicate into Dunham's solution, lobster broth, nutrient broth, and glucose broth. In the case of the liquor, further transfers were made into petri dishes which were poured with lobster and dextrose agar. One set of the duplicate tubes were placed in a large Novy's jar containing sufficient pyrogallic acid and 10 percent sodium hydroxide for the enclosed air space. The jar was exhausted by means of a suction pump, until an enclosed manometer showed a good vacumm. The jar was then incubated at 37°C. together with the aerobic cultures. In some isolations the paraffin oil method was employed. The cultures were examined in 18 to 24 hours for growth; if no growth was apparent, further incubation was resorted to; if growth could be noted, microscopic examinations and plate cultures were made. Transfers were made to dextrose agar slopes. In all isolations dextrose agar gave the best growths.

Aerobes and Anaerobes.

It is important to note here that in no case did organisms grow anaerobically and not aerobically. Many of the spore forming organisms were facultative anaerobes, but preferably aerobes.

Attention should be drawn at this point, that in the canning of lobsters, the methods differ somewhat from other canned foods, in that the cans are not exhausted by heating or the meat preheated before packing, or are any mechanical

methods employed. Anaerobic organisms existing under these conditions will not multiply as do aerobes, so that the anaerobes as a factor in spoilage is much less serious in canned lobsters than in other foods.

Where sterility tests are given under inspection data, only aerobic methods and dextrose agar were used. Since no anaerobic bacteria were isolated from discolored or normal cans and all organisms developed on dextrose agar, these were used as standard methods.

Isolated Organisms.

Nineteen organisms were isolated from discolored and normal lobster cans. These cans were secured from a number of commercial factories and were representative of the canning industry.

A SEARCH FOR DISCOLORATION ORGANISMS IN FRESH AND BOILED LOBSTERS.

Intestinal Bacteria.

One of the most potent sources of infection comes from the intestine of the lobster. For, it must be remembered that before leaving the cooling tables the body of the lobster is separated from the tail. In doing this, the intestine is broken into two portions and from the two open ends some of the contents will inevitably escape, and come into contact with the warm meat. In the semi-digested and refuse contents, bacteria are always present. On the warm moist meat, when lobsters are not cooled after the first boiling, bacteria multiply rapidly and infect the meat wherever they touch it. As soon as the tail meat is removed from its shell, the intestine is broken a second time at the extreme end, and additional bacteria may be discharged upon the table and the meat, with the result that when this tail meat is transferred to the tubs, the bacteria are scattered uniformly throughout the washing water.

Washing the Meat.

The next operation is that of washing the meat before placing it in the tins. The largest portions, like the tail meat, are usually washed by hand. The exact length of time that the water is used depends upon the judgment of the washer woman and the ease with which pure water can be obtained.

Where the washing water is used over, the process of infecting the meat goes on during the continuance of the canning of a whole catch.

Source of Water.

The source of water as brought out in the questionnaire depends upon the location of the factory, and sea, Well, spring or lake water may be used, however, the majority of the canneries used sea water.

In order to determine the types of bacteria associated with lobster under these conditions, their role in discoloration, the following series of experiments were carried out:-

1. Isolation of intestinal bacteria from freshly caught lobsters.
2. Isolation, but boiled in sea water for 15, 20 and 25 minutes.
3. Isolation, using boiled lobster which had been exposed on factory table for 12 hours.
4. Isolation, using lobster which had been killed and immersed in sea water for 24 hours.

EXPERIMENTAL.

Experiment 1.

Five fresh lobsters and three boiled ones were examined bacteriologically. The procedure of making inoculation was as follows:- The freshly caught lobster was tied by its large claws and suspended in a position convenient for the bleeding operation.

The ventral abdominal surface was washed and the sternum of the 5th. abdominal segment was sterilized with alcohol. With a sterile scalpel, a small incision was made through the body wall of this segment in the median line which penetrated the ventral abdominal artery. The colorless blood spurted out and was easily collected in sterile tubes. This was used in making media.

The body was then extended with ventral surface down, on a clean table, and the dorsal abdominal shell was removed. The abdominal muscles were cut and folded aside, and the hind gut exposed. Small areas on the intestinal wall were seared with a hot scalpel, incisions cut in these, and loops of intestinal contents withdrawn and immediately inoculated into sterile broth. Samples were taken in the region of the second, fourth and sixth segments and labelled N, M and H respectively. Small seared pieces of abdominal flesh from the left side in the region of the fifth segment were dropped into broth and these tubes labelled B. The carapace was cut away, also the ends of the exterior muscles, and the thoracic parts of the flexor muscles lying in the median line, and the "green glands" were exposed.

Inoculations were made using seared pieces of these thoracic muscles A, also using seared parts from the posterior coeca on the right side of the digestive gland mass L2, and from the left side L1. The terminal segment of the right large cheliped was removed and loopfuls of blood D1, D2 in the large chela transferred to sterile broth. Pieces of

muscle from the large claw of the left large cheliped were seared and dropped into broth C.

The dissection was made quickly, pieces of flesh and liver were seared before being transferred to broth, and all precautions were taken to prevent contamination of parts used as inocula.

Lobster peptone broth and agar were used. The distribution of bacteria in fresh and boiled lobster is indicated in Table I.

TABLE I.

Fresh	C	N	M	H	L1	L2	B	D1	D2	A
I		+	+	+	+	+				
II			+	++	+	+				
III			+	++	+	++				
IV		+	+	+	+	++				
V					+	+	+			
x Boiled										
I 15 mins.		+			+	+		+	+	
II 20 "		+			+	+		+	+	
III 25 "		+		+	+	+		+	+	

\+ Growth.

x Temperature of water 96°C.

Experiment 2.

This experiment was planned to compare the distribution of bacteria in boiled and fresh lobsters, and to compare with the distribution of bacteria in a lobster boiled for 15 minutes and then left exposed over night, and in a lobster killed and left immersed for 36 hours in sea water. It was observed that there was a marked deterioration and putrefaction in a lobster which had been killed and left lying over night (temperature 14°C). The liver was badly disintegrated and putrifying, the intestine was very soft, almost liquified, and the muscles in the region of the digestive gland were soft and slightly discolored.

A lobster which had been killed and left in sea water (temperature 11°C.) for 36 hours was examined. The liver and intestine were not disintegrated, nor was there a marked putrefaction. The muscle tissues were firm and normal in appearance. Whether there was a dissemination of bacteria through the tissues was determined, as was also the effect of exposing cooked lobsters for 12 or 16 hours before canning them.

Five lobsters of nearly equal size and weight were selected, one was bled, one was boiled in sea water at 100.5°C. for 15 minutes, another in the same kettle for 20 minutes and then left on the table for 16 hours. The fifth lobster was killed in fresh water, then left suspended in river water for 36 hours.

Inoculations were made as in the previous experiment and as follows:-

A	-	thoracic flesh.
B	-	abdominal flesh.
C	-	left large chela flesh.
D1, D2	-	right chela flesh.
M1, M2	-	intestinal contents.
L1, L2	-	digestive gland.

The results of this experiment are tabulated in Table II.

TABLE II.

Fresh	B	M1	M2	A	L1	L2	D1	D2	C
I. Fresh		+	+		+	+			+
II. Boiled 15 mins. Sea water 100.5°C.									
III. Boiled 20 mins. Sea water 100.5°C.									
IV. Boiled 15 mins. Left on table 16 hrs.									
V. Killed in fresh water. In sea water, 36 hrs.		+	+		+ +	+ +	+ +	+	+

+ Growth.

1. In Table III will be found a classification of the isolated organisms.

2. Of the fifty-six cultures obtained originally, twenty-one distinct types remained after they had been grouped according to their morphological characters, growth on gelatin, glucose broth, litmus milk and lobster peptone agar.

3. It is significant to note that of the twenty-one types isolated, only one spore forming organism was found.

TABLE III

Description of Bacterial Types Isolated from Lobsters.

No.	Source.	Morphology.	Agar Colonies.	Gelatin.	Motility.	H_2S	Litmus Milk.	And. Glucose.	Times Isolated.
23 48	N.Fresh I. L. " II.	Large rods 3-4 u single, ends flat, vacuolated.	1.5-3 m.m. Circular, convex, slimy, opaque, entire.	No surface growth, slight on line of puncture. No liquefaction.	-	-	-	-	2
25 67	N.Fresh I. M. " IV.	Coccoid to small rods, singly and in pairs.	1.5 m.m. circular thickly convex slimy opaque yellowish in centre.	No surface growth. Submerged colonies entire.	-	-	-	Acid	2
27 30 34 65 69 61 64 75 76	M.Fresh I. H. " " L. " " H. " IV. N. " "	Rods 1 to 1.5 u ends rounded, single, some coccoid.	Embedded - double convex. .75 m.m. crystalline in appearance, erose rough. Surface, 1.5 c.m. circular, flat convex, white centre, greyish translucent margin.	Liquified, rapiform, little surface growth.	+	+	-	Acid	9 F.I 3 F.IV 6
28 31	M.Fresh I. H. " "	B.coli like	Embedded colonies grumose, erose, homogenous double convex shape.	Very little surface growth, no growth on line of puncture. No liquefaction.	+	-	Alk.	+	2
29	M.Fresh I.	Coccus, pairs groups.	Circular, 4 m.m. thickly convex. Lemon yellow, slimy, granular.	Surface growth yellow. No liquefaction	+ 2 .	-	Acid	Acid	1

TABLE III (Continued).

No.	Source.	Morphology.	Agar Colonies.	Gelatin.	Motility.	H_2S.	Litmus Milk.	And. Glucose.	Times Isolated.
35 79 77	M.Boiled II. M1 " III. L2 " III.	Rods 2-3 u x 1 u ends rounded, spores central.	Surface:raised flat lobed,spreading **creamy**.	Convoluted, pellicle at surface,crateriform liquefaction, osserobic growth slight.	+	+	Acid digestion	Acid	4 BII - 1 BIII- 3
49	L.F. II.	like 41.	flat, circular to oblong.	like 41.	+	+	-	Acid	2
55 80	M.F. III. H.F. III.	like 40. B.coli like	Slimy,moist,thin, flat, greyish or greenish,circular and spreading.	Napiform liquefaction.	+	+	Acid dig.	Acid - gas	2
70	H.F. III.	Wide rod. 1½ u wide x 1 u long.	Thick, white spreading all over plate,moist,slimy surface reticulated.	Napiform liquefaction.	+	+	-	Acid	1
54	M.F. III.	Large single rods, no chains some curved.	Flat, raised circular, entire homogeneous,slimy, finely granular.	Complete liquefaction.	+	-	-	Alk.	1
60	M.B. II.	Long narrow rods single,arranged parallel, ends rounded.	Circular, flat entire, fine granular centre brownish with radiate markings.	No liquefaction Slight surface growth.	+	-	-	-	1

TABLE III (Continued)

No.	Source.	Morphology.	Agar Colonies.	Gelatin.	Motility.	H_2S.	Litmus Milk.	And. Glucose.	Times Isolated.
62	M.F. IV.	like 40	Convex, thin, embedded, yellowish opaque, margin rough	Napiform liquefaction.	+	+	-	-	1
73 74	L.F. V.	like 54. smaller than 66, some coccoid.	Spreading, creamy, flat, raised, coarse, granular, shining.	Complete liquefaction.	+	+	-	-	2
68 71 72 57 58	L1 F.V. " " L2 " " " F.IV.	Rods, single ends rounded	Spreading, raised flat, lobed contoured, greyish	Napiform liquefaction.	+	-	Acid	Acid	5
36	M.B. II.	Thin rods, 3 x 1 u single, slightly curved.	Circular, 2 m.m. flat, granular entire, cream color, margin filamentous.	Little surface growth. No liquefaction	-	-	Alk.	Acid	1
37 38 63	M.B. II. N.F. IV. " "	Rods, chains.	Surface colonies rather discrete circular 2-4 m.m. white, slimy, moist convex, flat surface.	Good surface growth Beaded liquefaction. Crateriform.	+	+	Alk.	Acid	3 B II.-1 B IV.-2
39 56 59	2M B. II. 1D B. II. " "	Coccus, pairs, groups.	Circular, thickly convex entire, granular creamy.	Slight surface growth. Beaded in gelatin. No liquefaction.	+	+	Acid. dig.	Acid	3

TABLE III (Continued).

No.	Source.	Morphology.	Agar Colonies.	Gelatin.	Motility.	H_2S.	Litmus Milk.	And. Glucose.	Times isolated.
40 51 52 53	M.F.II. H.F.III. M.F.III. " "	Almost coccoid rods, short rounded ends, single pairs.	Ameboid, diffuse surface growth spreading, thin, flat, raised, most greyish. Rapid growth.	Liquified rapiform	+	-	dig.	Acid	4 F.II- 1 F.III-3
45	H.F. II.	Large rods, single cells and chains.	5 c.m. diam. circular, convex, thick, margin waxy, moist, granular.	Surface growth napiform, liquefaction.	-	-	Alk.	-	1
66	M.F.IV.	Rods 1.5 x 3 u rounded ends, single, curved.	Similar to 45.	Slight anaerobic growth, liquefaction, napiform.	-	-	-	-	1
46	H.F. II.	Rods, 1.5 x 3.5 u	Embedded, convex densely white.	Growth, good liquefaction almost complete.	+	+	-	-	1
41 42 43 44 47	H.F. II.	Single rods, 2 to 4 u long, uniform width homogenous	Circular lobate 1 c.m. diam. thin, flat, smooth, entire, transparent, finely granular.	Little surface growth, line small beaded growth. No liquefaction.	+	+	-	Alk.	5

Preliminary Experiments on Blackening.

Throughout the summer of 1920 and previous to the factory experimental packs, some one hundred and fifty experiments were conducted in the laboratory with the previous isolated organisms to determine if bacteria were the prime factor involved in the production of discoloration or blackening in canned lobsters. In that the experiments were more suggestive than conclusive, only a brief summary will be given.

I. Sterile lobsters inoculated with organisms isolated from spoiled cans, intestinal tract, boiling vats, and sea water did not give typical discoloration.

2. Sterile lobster with the addition of chemically pure metals as tin, lead, copper, iron, zinc, in various combinations and proportions did not give typical discoloration.

3. Sterile lobster with the above metals and bacteria did not give typical discoloration.

4. Similar experiments with salts of the metals gave no discoloration.

5. Experiments with variable PH values of pickle, including bacteria and metals in different combination did not give discoloration.

6. Experiments involving bacteria, solder, gasket, and paper linings were not typical.

7. While discoloration of varying intensities were produced in some experiments and appeared to be typical, it

was, at all times, accompanied by putrefaction , which is not typical of can discoloration in the majority of cases.

EVIDENCE OF OTHER CAUSES.

From the foregoing experiments, it was evident that other factors than the above must be responsible for the discoloration. It was then decided that experimental packs of canned lobsters should be made under commercial conditions during the next licensed season.

EXPERIMENTAL SPRING PACK.

Introduction.

Previous investigations led to a decision that experimental packs of canned lobsters should be made under commercial conditions during the next licensed season.

During the spring of 1921, an experimental laboratory was established and equipped in a factory of the Portland Packing Company at North Rustico, Prince Edward Island.

According to the Fisheries Amendment Act 1918, lobster canneries are granted licenses for the spring season, from April 25th. to June 26th. Experimental packs representative of the spring season were made during this time.

Plan of Experiments.

The general plan of the experiments in this investigation is based primarily on the "theories" advanced in the questionnaire as to the causes of discoloration in canned lobsters on page 15. As the work progressed new ideas have been advanced, and experimental packs made wherever warranted.

The experimental packs were put up as nearly as possible according to the regular practice of canning plants. Where lobsters were being packed in cans of the same size as those used for experimental work, experimental cans were put in the canning line in place of regular cans. In other cases slight changes from the regular practice were made in handling the lobster meat and packing.

Range of Coating

In order to determine the factors influencing erosion of the cans, a series of tin plate carrying varying weights of tin coating was manufactured. The weights of tin from which the experimental cans were made is as follows:-

A-coke quality, approximately 1.5 pounds of tin per base box;
B-Kanner's special quality, approximately 2.0 pounds of tin per base box;
C-2A Charcoal plate, " 2.5 " " " "
D-3A " " , " 3.0 " " " "

Where experimental packs were made to determine the effect of the can contents on the plate, the four grades of plate as above mentioned were used together with the coke enamel cans.

Description of Cans.

Throughout the investigation, commercial sanitary cans were employed. The ½ lb. size was used for all experiments. In the study of heat penetration larger size cans were used, including the ½ lb. and the 1 lb. tall and flat.

The cans were manufactured and supplied by the American Can Company, Hamilton, Ontario. In all, 2500 cans were made, including 500 each of the various grades of tin plate. The cans were as follows:-

500 1/4# Lobster Cans (2-15/16" x 1-¼") made from Plain Coke Plate. These cans were identified by one dot or small depression in the side seam, and the ends by one dot or depression in the principal bead.

500 1/4# Lobster Cans (2-15/16" x 1-½") made from Plain Open Hearth Kanners' Special Plate. These cans were identified by two dots in the side seam, and the ends by two dots or depression in the principal bead.

500 1/4# Lobster Cans (2-15/16" x 1-½") made from # 2A Plain Charcoal Plate. These cans were identified by three dots in the side seam, and the ends by three dots or depressions in the principal bead.

500 1/4# Lobster Cans (2-15/16" x 1-½") made from # 3A Plain Charcoal Plate. These cans were identified by four dots in the side seam, and the ends by four dots or depressions in the principal bead.

500 1/4# Lobster Cans (2-15/16" x 1-½") Coke Enamel Sanitary. These cans were identified by no dot or depression in the side seam or in the bead end.

In the inspection data, the various grades of plates were designated as one dot, two dot, three dot, four dot and lacquered can.

<u>Description of Marking Experimental Cans.</u>

A simple system for marking the can ends was devised, by which it was possible to keep a complete history of the

can. 3/16 inch steel figures and letters were used individually and in combination. Covers were stamped and placed with the corresponding can for rimming. Experimental packs and inspection data were identified by these symbols.

Methods of Sterilization.

As brought out by the questionnaire, only one percent of the packers used pressure methods of sterilization. In order to try out the feasibility of pressure cooking as contrasted to the continuous method; its effect upon lobster meat, and its introduction into the industry on a more extensive scale, a number of the experimental packs were conducted in duplicate, up to the point of sterilization. One-half of the cans were then pressured, and the remaining half cooked by the continuous method.

The writer takes this opportunity of thanking the American Can Company for supplying the cans gratis. Their interest and willingness throughout the investigation have been fully appreciated.

EXPERIMENTAL PACKS.

Experimental Pack A and A1.

Packed May 23, 1921.

No. of Cans, 20.

For this experiment lobsters were caught on the 21st., and placed in cages and sunk in clear water in a tide way. They were taken from the traps the 23rd., a.m. dead. These lobsters were then boiled the usual way. The meat from these lobsters was quite soft, the body meat too soft to pack. The claw meat was firmer, but still of poor consistency.

Practically there would not be any chance of the body meat going into cans, but claw meat would undoubtedly escape observation and would go in among good lobsters. This meat was packed in lacquered cans, and on top of each can, a few pieces of good sound meat, mostly claws, and white rather than red, were placed.

To the 10 cans marked A, factory pickle was added. After final sterilization, the reaction of the pickle was PH 7.6.

To the 10 cans marked A1, factory pickle was added. In this pack the pickle was adjusted by the addition of acetic acid, so that, after processing, the final reaction of the can was PH 6.2.

All cans were processed one hour after packing at temperature of 240oF. for 30 minutes.

N.B. - The salt content of the factory pickle varies from 4-10 percent, depending upon the packer.

Experimental Pack B and B1.

Packed May 26, 1921.

No. of Cans, 100.

In this pack, the various grades of tin plate were employed, including the one dot, two dot, three dot, four dot and lacquered can. Throughout, these cans represent a normal commercial pack. 20 cans of each grade of plate were packed.

50 cans marked B were processed at 240°F. for 30 minutes.

50 cans marked B1 were boiled at 212°F. for three hours.

The final reaction of the cans after processing was PH 7.6.

Experimental Pack C and CI.

Packed May 26, 1921.

No. of Cans, 100

This pack was similar to B and B1. The reaction of the pickle was adjusted by the addition of acetic acid, so that, after processing, the resulting reaction was P H. 6.2.

50 cans marked C were processed at 240°F. for 30 minutes.

50 cans marked C1 were boiled at 212°F. for 3 hours.

Experimental Pack D and D1.

Packed May 26, 1921.

No. of Cans, 100.

This pack was similar to B and B1. The final reaction of the cans was adjusted to P_H 6.2. by the addition of acetic acid. One and one-half times the amount of pickle was added.

50 cans marked D were processed at 240°F. for 30 minutes

50 cans marked D1 were boiled at 212°F. for 3 hours.

Experimental Pack E and E1.

Packed May 26, 1921.

No. of Cans, 100.

This pack was similar to B and B1, with the addition of one and one-half times of normal factory pickle. Final PH was 7.4.

50 cans marked E were processed at 240°F. for 30 minutes
50 cans marked E1 were processed at 212°F. for 3 hours.

Experimental Pack H and H2.

Packed May 27th 19 21.

No. of Cans, 100.

As in pack B and B1 the various grades of tin plate were used. Cans were normally commercially packed. The reaction of cans was adjusted, so that, after processing, the final P.H was 6.2. They were then exhausted by placing in a retort for 5 minutes at 226°F. They were immediately removed, rimmed and processed.

50 cans marked H were processed at 240°F. for 30 minutes.
50 cans marked H2 were boiled at 212°F. for 3 hours.

Experimental Pack K and K2.

Packed May 27, 1921.

No. of Cans, 100

As in pack H and H2 with the addition of factory pickle. Final PH was 7.5

50 cans marked H were processed at 240°F. for 30 minutes
50 cans marked H2 were boiled at 212°F. for 3 hours.

Experimental Pack L and L2.

Packed May 27, 1921.

No. of Cans, 80

This pack was similar to B and B1. The reaction of the cans was adjusted by the addition of acetic acid. The final PH after processing was 6.2. Commercial parchment linings were added to all grades of tin plate.

Lacquered cans were not used in this pack.

40 cans marked L were processed at 240°F. for 30 minutes

40 cans marked L2 were processed at 212°F. for 3 hours.

Experimental Pack N and N2.

Packed May 27, 1921.

No. of Cans, 80

Packed as in L and L2, but with factory pickle.

Final PH 7.4.

40 cans marked N were processed at 240°F. for 30 minutes

40 cans marked N2 were processed at 212°F. for 3 hours.

Experimental Pack P.

Packed May 27, 1921.

No. of Cans, 15.

During a morning's operation, unwashed arm meat was collected. Three cans each of the various grades of tin plate were packed, factory pickle was added, and all processed at 240°F. for 30 minutes. The final PH of the cans was 7.4.

Experimental Pack P3.

Packed May 27, 1921.

No. of Cans, 15.

Packed as in P, but delayed in cans 24 hours before processing. Final reaction was PH 7.4.

N.B. This meat had an acid odor on opening cans before processing.

Experimental Pack J.

Packed May 27, 1921.

No. of Cans, 17

The meat for this pack consisted of claw meat, taken from the bottom of a wooden boiler. This meat was taken at 1.45 p.m., after receiving several boilings, and was representative of claw meat that is very often used for canning at the end of the day's run. The final reaction was PH 7.4.

This was packed in four dot cans with factory pickle and processed at 240°F. for 30 minutes.

Experimental Pack R.

Packed May 28, 1921.

No. of Cans, 5.

Coagulated lobster blood was collected from 7.00 to 10.00 a.m. This was packed in one dot cans and processed at 240°F. for 30 minutes. Final reaction was PH 7.2.

Experimental Pack J X.

Packed May 28, 1921.

No. of Cans, 5

As in experimental pack R, but delayed in factory 7 hours before processing. Final reaction was PH 7.2

Experimental Pack Q and Q4.

Packed May 28, 1921.

No. of Cans, 70

For this pack lobsters were boiled at 4.10 p.m. Saturday. These were then placed in wire baskets and held in the factory until Monday 7.30 a.m. They were then handled under factory conditions and packed in one dot cans.

35 cans were processed at 240°F. for 30 minutes.

35 cans were boiled at 212°F. for 3 hours.

Experimen tal Pack Y and Y2.

Packed May 28, 1921.

No. of Cans, 20.

These lobsters were caught on the 28th., and placed in cages and sunk in clear water in a tide way. They were taken from the cages on the morning of the 30th dead. They were then handled under factory conditions, packed in lacquered cans, and processed at 240°F. for 30 minutes.

10 cans marked Y contained factory pickle.

10 cans marked Y2 contained factory pickle, but were adjusted with the addition of acetic acid to PH 6.2.

Experimental Pack S5.

Packed May 30, 1921.

No. of Cans, 50.

This was a normal factory pack. No pickle was added. As the meat was drained dry, the cans contained approximately 10 cc. of juice and wash water. 10 cans each of the various grades of plate were packed. All cans were processed at 240°F. for 30 minutes.

Experimental Pack S.

Packed May 30, 1921.

No. of Cans, 50.

This was a normal factory pack. After cans were sealed, they were delayed 24 hours before processing. 10 cans each of the various grades of plate were packed. All cans were processed at 240°F. for 30 minutes.

Experimental Pack S.L.T.

Packed May 30, 1921

No. of Cans, 70

In this pack lacquered cans were normally packed with meat, To each of 10 cans, various grades of pickle were added, increasing in strength by 2 percent up to 14 percent of salt. All cans were processed at 240°F. for 30 minutes.

Experimental Pack J X S.

Packed June 4, 1921.

No. of Cans, 5

Tail meat that had been removed from the shell at 4.30

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

was held over night in the factory. It was packed at 8.30 a.m., normally, and processed at 240°F. for 30 minutes.

Experimental Pack A8.

Packed June 5, 1921.

No. of Cans, 12.

Lobsters boiled at 5.00 p.m. were held on the cooler unshelled over night. At 7.00 a.m. next day they were removed from the shells, packed at 8.30 a.m. in lacquered cans, and held in cans without covers till 10.00 a.m. They were then processed at 240°F. for 30 minutes.

Experimental Pack S.E.A.

Packed June 6, 1921.

No. of Cans, 12.

This was a normal pack in lacquered cans. Pickle was made from sea water, containing 7 percent of salt. The pickle used in all other packs was made from spring water. These cans were processed at 240°F. for 30 minutes.

Experimental Pack G.S.T.

Packed June 7, 1921.

No. of Cans, 12

This was a normal pack, but contained pieces of paper gasket, mixed with the meat throughout the can. This was packed in lacquered can and processed at 240°F. for 30 minutes.

Experimental Pack T.I.N.

Packed June 7, 1921.

No. of Cans, 12.

Packed similar to previous pack, but with the addition of pieces of cut tin plate.

Experimental Pack W.V.

Packed June 7, 1921.

No. of Cans, 12.

Normal pack, but containing both pieces of gasket and tin plate. Processed at 240°F. for 30 minutes.

Experimental Pack J.Y.

Packed June 7, 1921.

No. of Cans, 6

This was a normal pack in lacquered cans. Gaskets were removed before the cans were sealed. Processed at 240°F. for 30 minutes.

Experimental Pack F.O.

Packed June 8, 1921.

No. of Cans, 6.

This was a normal pack in lacquered cans. Strips of filter paper saturated with lead acetate solution were added to the can . Processed at 240°F. for 30 minutes.

Inspection of Packs.

On completion of the experimental packs at Rustico and Bordon, Prince Edward Island, cans were shipped to the laboratory, where all inspections were carried out. The cans were stored in the basement at approximately a temperature of 20°C. One, three, six and nine months from date of packing inspections were made. Cans were removed from the stacks at random, a given number from each experimental pack.

Sterility tests were carried out after Bitting and Bitting[1] using dextrose agar. All plates were incubated at 37°C. for five days.

The hydrogen ion concentration was determined by the colorimetric method of Clark.[2]

For inspection of the can interior, and its contents, tops were removed by cutting under the seam of the top side of the cans. The contents were then transferred into white earthenware plates and examined for discoloration. The occurrence and amount of such was recorded by the use of the key on page 57.

1
Bitting and Bitting: Bacteriological Examination of Canned Foods. Research Laboratory, National Cann ers' Association, Bulletin No. 14, Dec. 1917.

2.
Clark: The Determination of Hydrogen Ions. - Williams and Wilkins, 1920.

EXPERIMENTAL FALL PACK.

Introduction.

During August, 1921, an experimental laboratory was set up in the factory of Mr. Howatt, Borden, Prince Edward Island.

According to the Fisheries Amendment Act 1918, the close season extends from August 15th. to October 16th., 1921. This applies only to the territory extending from West Point to the Eastern Entrance of Victoria Harbor. Experimental packs representative of this season were made during the later part of August and the early part of September.

Plan of Experiments.

The experiments in this investigation were carried out similar to those of the spring pack, including the various grades on tin plate, style of cans, methods of marking and processing.

Experimental Packs.

Experimental Pack B and B1.

Packed August 25, 1921.

No. of Cans, 100

In this pack the various grades of tin plate were used, including the one dot, two dot, three dot, four dot and lacquered can. Throughout, these cans represent a normal commercial pack. 20 cans of each grade of tin plate were used. After cooking the final reaction of the cans was PH 6.8.

20 cans marked B. were processed at 240°F. for 30 minutes.
50 cans marked B1 were boiled at 212°F. for $2\frac{1}{2}$ hours.

Experimental Pack C and C 1.

Packed Aug. 27, 1921.

No. of cans, 100.

This experiment was similar to B and B1. The pickle in this pack was adjusted by the addition of acetic acid so that after processing the final reaction of the cans was PH . 6.6.

Experimental Pack D.and D 2.

Packed Aug. 29, 1921.

No. of cans, 100.

This experiment was similar to C and C1. The pickle in this was adjusted by the addition of citric acid, so that after processing the final reaction of the cans was PH 6.4. One and one half times the quantity of pickle was added.

50 cans marked D were processed at 240°F. for 30 minutes.
50 cans marked D 2 were boiled at 212°F. for $2\frac{1}{2}$ hours.

Experimental Pack E and E 2.

Packed Aug. 29, 1921.

No. of cans, 100.

This pack was similar to B and B1. The pickle from this experiment was adjusted by the addition of caustic potash solution. The final reaction after procession of the cans was P.H . 7.4.

50 cans marked E were processed at 240°F. for 30 minutes.
50 cans marked E 2 were boiled at 212°F. for $2\frac{1}{2}$ hours.

Experimental Pack N and N 2

Packed Aug. 26, 1921.

No. of cans, 80.

This pack was similar to B and B 1. Commercial parchment linings were added. The lacquered cans were not used. The final reaction was PH . 6.8.

40 cans marked L were processed at 240°F. for 30 minutes.

40 cans marked L 2 were boiled at 212°F. for 2½ hours.

Experimental Pack L and L 2.

Packed Aug. 29, 1921.

No. of cans, 80

Packed as in N and N 2. The pickle for this experiment was adjusted by the addition of citric acid. The final reaction after processing was PH 6.4.

40 cans makked L were processed at 240°F. for 30 minutes.

40 cans marked L 2 were boiled at 212°F. for 2½ hours.

Experimental Pack X and X 1.

Packed Aug. 28, 1921.

No. of Cans, 100.

This pack was similar to E and E 2.

The final PH was 7.4.

50 cans marked X were processed at 240°F. for 30 minutes.

50 cans marked X 1 were boiled at 212°F. for 2½ hours.

Experimental Pack S and S 2.

Packed Aug. 27, 1921.

No. of Cans, 100

This pack was similar to B and B1. The reaction was adjusted by the addition of citric acid. The final reaction after processing was P.H 6.4.

50 cans marked S were processed at 240°F. for 30 minutes.
50 cans marked S 2 were boiled at 212°F. for $2\frac{1}{2}$ hours.

Experimental Pack T and T 2.

Packed Aug. 29, 1921.

No, of cans, 54

In this pack the various grades of tin plate were not taken into consider ation. Cans were lined with commercial parchment linings. One and one half times the quantity of pickle was added. The reaction was adjusted by the addition of citric acid. These cans were exhausted by heating in flowing steam for 20 minutes. The final reaction was P.H 6.4 after processing.

27 cans marked T were processed at 240°F. for 30 minutes
27 cans marked T 2 were boiled at 212°F. for $2\frac{1}{2}$ hours

Experimental Pack N 3 and N 4

Packed Sept. 1, 1921.

No. of Cans, 2

N 3 was a normal pack. The final reaction was PH 6.6. Two wire nails were added to each can.

N 4 was a normal pack. The final reaction was PH 7.4. Two wire nails were added to each can.

Experimental Pack Y 8.

Packed Sept. 1, 1921.

No. of Cans, 5

Lobster in spawn were used for this pack. The spawn was removed by a gasoline engine exhaust. Cans were packed commercial and boiled at 212°F. for $2\frac{1}{2}$ hours.

Key to Inspection Data.

1. Growth on agar designated as:-

   Absent,
   Present.

2. Hydrogen ion concentration of pickle.

3. Discoloration on interior of can.

4. Discoloration of meat from interior discoloration of can.

5. Discoloration of pickle from interior discoloration of can.

3, 4 and 5 designated as:-

   None,
   Trace,
   Slight,
   Bad,
   Very bad.

6. General appearance of meat designated as:-

   Normal - Bright and keen;,
   Dead - Dull in appearance
   Discolored; (a) Slight
   (b) Marked.

7. General appearance of pickle designated as:-

   Normal - Clear with slightly pinkish color;
   Brown - Turbid;
   Discolored:- Slight,
   Marked.

EXPERIMENTAL DISCOLORATION.

CAUSES OF DISCOLORATION.

Results of experimental packs of canned lobsters during the spring and fall of 1921 have proven that discoloration was due to chemical and bacterial causes.

Chemical Discoloration.

Chemical discoloration in canned lobsters has been found to be due to the following agencies:-

1. Liberation of hydrogen sulphide with the formation of iron sulphide;
2. Action of pyridine on tin plate;
3. Variation in canning operations;
4. Variation in PH of the can contents;
5. Disuse of parchment linings;
6. Improper washing of meat.

1. Liberation of hydrogen sulphide with the formation of iron sulphide.

The black discoloration occurring in lobster tins which effects the can interior has been found to consist of very finely divided iron sulphide. This substance forms through the union of hydrogen sulphide and iron. In the early stages brown oxide of iron forms, which later develops into the black sulphide. This substance appears to form about the eighth or tenth day after processing. When the can is stacked in the store room, hydrogen sulphide which

has been formed during the cooking combines with exposed iron in certain areas of the can. Where this condition obtains, and where exposed iron is present in the can, black sulphide of iron will be formed. Where cans are processed and stacked in the same position, the black substance does not often form on the portion of the can covered by the meat and liquor, but always occurs in the head space. If the containers become inverted during storage or shipping, black sulphide will be formed on the bottom of the can, so that sulphide formation may show at the headed and factory end.

The figures below are taken from Atwater[1] from a series of analyses of the chemical composition of lobsters.

Chemical Analysis Calculated on Dry Substance.

	Percent.
Nitrogen	12.54
Albuminoids (N X 6.25)	78.37
Fat	11.43
Crude ash	10.06
Phosphorous as P_2O_5	2.24
Sulphur	1.23
Chlorine	3.46

In comparing the sulphur content of lobsters, it is apparent that sulphur compounds are much in excess of other canned foods. A few figures from Sherman[2] will suffice to show this difference.

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[1] Atwater, W.O. - Bulletin of the U.S. Fish Commission, Vol. XIX, 1899.

[2] Sherman - Chemistry of Food and Nutrition, Second Edition, 1919.

Apples	-	.006 percent sulphur.
Asparagus	-	.041
Beans	-	.030
Clams	-	.224
Corn	-	.046
Milk	-	.034
Peas	-	.063
Tomatoes	-	.014
Lobsters	-	1.235

The writer has labored under the impression that where sulphur bearing proteins were abundant, the amount of volatile sulphur compounds liberated during the processing would be very great. An explanation of the increase in hydrogen sulphide was thought to be responsible for the increased production of discoloration through sulphide formation. It was proven that the quantity of hydrogen sulphide liberated during the heating period was not of prime importance, as fall pack lobsters were found to evolve as much hydrogen sulphide as the spring pack lobsters, yet the degree of discoloration was much greater in the spring than in the fall. To further substantiate the part of hydrogen sulphide in discoloration, it was found that where the PH of the spring pack was adjusted from 7.6 to 6.2, lobsters were free from discoloration, while the adjustment of the PH of the fall pack from 6.6 to 7.6, lobsters were highly discolored with iron sulphide. Experimental packs C and C1 of the spring, and experimental packs X and X1 of the fall, bear out the conclusions that, while discoloration is produced through hydrogen sulphide, resulting in iron sulphide formation, the degree is influenced by the hydrogen ion concentration of the lobsters.

The data in Table lV show the amounts of hydrogen sulphide evolved at 212°F.

Table lV.

Amount of Hydrogen Sulphide Liberated in Successive Half Hour Periods.

Pack.	Temperature.	Mg. per 800 grams of lobsters.				
		1	2	3	4	5
Spring	212°F.	.151	.526	.718	.560	.409
Fall	212oF.	.141	.630	.781	.425	.389

Method of determining hydrogen sulphide in lobsters.

300 c.c. of distilled water were added to 800 grams of lobsters. The mixture was gently heated to boiling, and the gas collected in 50 c.c. of tenth normal ammonical cadmium chloride. At the end of half hour periods, the flask was replaced by a new one. The precipitate of cadmium sulphide was filtered, washed, transferred to a beaker and macerated with 100 c.c. of water. This was acidified by the addition of dilute Hcl and immediately titrated with $\frac{N}{100}$ iodine, using starch.

N.B. A standard method of determining hydrogen sulphide is to collect the gas in cold water. Definite quantities of the solution are then added to an excess of $\frac{N}{10}$ iodine, and the excess iodine titrated with $\frac{N}{10}$ sodium thiosulphate. This method was found to give too high results, due to the presence of a volatile base which carried over and reduced the iodine.

This base was found to be pyridine. Where substances of this nature are present, the above method has a limited use.

2. Action of Pyridine on Tin Plate.

It was thought that some light might be thrown upon the subject of can erosin by a study of the lobster meat. Ordinary tin containers employed for the preservation of lobsters are rapidly corroded and in old cans the tin lining is completely removed. To prevent this, the cans are lined with parchment paper, and corrosin is then only noted at the junction of the papers and at points where, for some reason, the paper is pressed against the tin coating. The liquor separated from the spring pack lobsters was found to be PH 7.6. The alkalinity was also measured as follows:-

50 grams of this liquor required 8.7 c.c. of tenth normal Hcl to make it neutral to azolitmin;

50 grams of this liquor required 34.7 c.c. of tenth normal Hcl to make it neutral to methyl orange;

50 grams of this liquor required 6.2 c.c. of tenth normal sodium hydroxide to make it neutral to phenolphthalein.

These results show that this liquor contains quite a large quantity of a moderately weak base partly combined with a weak acid, and hence largely hydrolyzed to contain conside-able numbers of hydroxyl ions.

To further study this point, 2000 grams of lobsters were ground up, covered with 95 percent alcohol, and allowed

to extract for two days. The extract was passed through muslin and the filtrate distilled. The distillate gave a strong alkaline test with litmus paper, and positive reactions with all pyridine tests.

A 1 percent solution of pyridine was boiled for one hour with two plates of thin tin, each 2 by 3 inches. In one case 1.6 mg. and in the other case 1.2 mg. went into solution.

It appears, therefore, that pyridine exists in canned lobsters in an alkaline medium, and explains partly the corrosive action on tin containers.

In lobsters with a P_H of 6.2 pyridine was not distilled over. It combines with acids to form salts which do not volatilize at 100°C.

3. Canning Operations.

Vacuum.

It should be clearly understood that the method of canning lobsters differs somewhat from other canned foods. In packing, the cans are not exhausted by heating or the meat preheated before packing, or are any mechanical methods employed. Previous to canning the meat is boiled in the shell, it is then removed and washed a number of times in cold water, and finally packed with the addition of cold pickle. During the early season of packing, the water for washing is very cold, so that the cans usually commence processing at about 50°F. Where cans are packed under this

condition, no vacuum is present. With this method of packing it is found that conditions for chemical discoloration are very much favored as compared with cans with a high vacuum.

Tightness of Seam.

Under factory conditions the operation of rimming is not at all times uniform, due to machine changes necessitated in the various size of cans, and other uncontrollable factors. Where the slightest degree of looseness appears in a double seam, air will enter. This may result in a leak, or a resealing of the can.

From the experimental data, it appears that where air enters the can after processing, due to poor rimming, a formation of rust always forms, which later turns black, and, in advanced cases, the portion of the can exposed in the head space often becomes coated with a thick layer of a spotted rust like incrustation of a greyish dull black.

4. Variation in PH of the Can Contents.

The hydrogen ion concentration of the spring experimental packs averaged 7.6, while the fall experimental packs averaged 6.6. In comparing lobster of the two packs, it is apparent that the degree of chemical discoloration is much more serious in the spring packs. Changes in hydrogen ion concentration affecting chemical discoloration will be considered more fully under the heading of chemical influences on discoloration.

5. Parchment Linings.

Can linings of vegetable parchment were introduced many years ago as a remedy against chemical discoloration of the meat from the container. The practice, so far as can be learned, led to no improvement commercially. The device was pretty, and gave a pleasant appearance to the can interior.

During the last few years, the use of linings has been discontinued by many packers, owing to the supposition that they do not prevent discoloration. From experimental data, they are found to be helpful in the prevention of meat discoloration from chemical discoloration of the can, and are to be recommended.

6. Improper Washing.

Chemical discoloration of the meat is found to be influenced by the thoroughness of the washing. Where all traces of blood are removed from the meat, the blueing which characterizes the presence of blood, is found to be absent.

2. Bacterial Discoloration.

Bacterial discoloration in canned lobsters has been found to be due to the following agencies:-

1. Delay previous to sterilization;
2. Use of dead lobsters;
3. Understerilization;
4. Leaks.

1. Delay Previous to Sterilization.

Lobster is one of the most perishable foods. Where lobsters are delayed in handling and where bacterial action has taken place to any appreciable extent during canning operations, and previous to sterilization, the resulting product shows different degrees of discoloration. As bacterial action is controlled by temperature, this form of discoloration occurs to a greater extent during the warmer days of packing. Where meat is delayed in the process of handling, no visible changes are apparent and only after sterilization is the discoloration produced. This explains why cans may be sterile on examination, and yet the meat appear highly discolored, as if this discoloration is due to the action of bacteria within the container or their products upon the tin.

2. Use of Dead Lobsters.

Where fishing is interferred with during high tide, or where lobsters are caught in excess of the capacity of the plant, it is a common practice to hold live lobsters in cages in running water. Under these conditions, a small percentage die. Where the lobsters are carelessly handled, many of these find their way to the boiling vats. Lobsters in this condition, which have undergone bacterial changes, will produce not only dark discoloration but the meat will be of an inferior quality; of a dead,dull,greyish color.

3. Understerilization.

In discolored cans there appears to be no direct relationship between discoloration and unsterile cans, or between discoloration and sterile cans. In many instances, cans showing a marked degree of discoloration are sterile, on the other hand, cans that are contaminated show the same degree of discoloration as sterile cans. Other cans, both sterile and unsterile, show varying degrees of discoloration to the normal. In unsterile cans, either bacilli or cocci are present, and in many cases both. No predominating strains are present.

4. Leaks.

Where varied forms of discoloration are found the cause is due to leaks. This condition is present in only a very small percentage of cans, so that commercially it is not important. A careful examination of the cans before filling and after sealing are essential.

Experimental Forms of Discoloration.

Experimental packs showed the following forms of discoloration to be present. The forms under study divide themselves into two kinds:- First, chemical, and secondly, bacterial. For the sake of clearness, chemical forms have been distinguisned from bacterial, and each will be discussed in detail.

Chemical.

I. Inky black discoloration on the can interior.
2. Inky black discoloration of the meat.
3. Black discoloration of the paper lining.
4. Brown discoloration of the paper lining.
5. Inky black discoloration of the pickle.
6. Brown incrustation of the can interior.

Bacterial.

I. Inky black discoloration of the meat.
2. Blueing of the meat.
3. Dull yellowish white of the meat.
4. Varied, other than above.

I. Inky Black Discoloration of the Can Interior.

On opening cans of this character it was observed that discoloration first commenced as brownish spots or areas, confined either to the surface or the rimmed areas of the can. In advanced cases the brown develops to a black. In inspection data, where discoloration was designated as trace and slight, only small areas were visible on the tin or seam; where discoloration was designated as bad and very bad a narrow ribbon varying in outline and from I/8 to I/4 of an inch in width was visible. This color was confined to the seams and to the junction of the cover, and bottom of the can. In some cases the blackening was confined to the top seam, in others to the bottom, and in some to both.

Discoloration was often found to occur at the side seam, and occasionally dark spots were scattered irregularly over the interior of the can. Figure I, Plate I, shows the top of a sanitary can highly discolored by chemical action. In cans of this kind the seams were completely blackened, and toward the interior of the can top numerous black spots were also visible.

Figure 3, Plate I, illustrates a normal sanitary can top, taken from an experimental pack free from discoloration.

Fig.I.

Fig.II.

Fig.III.

PLATE I.

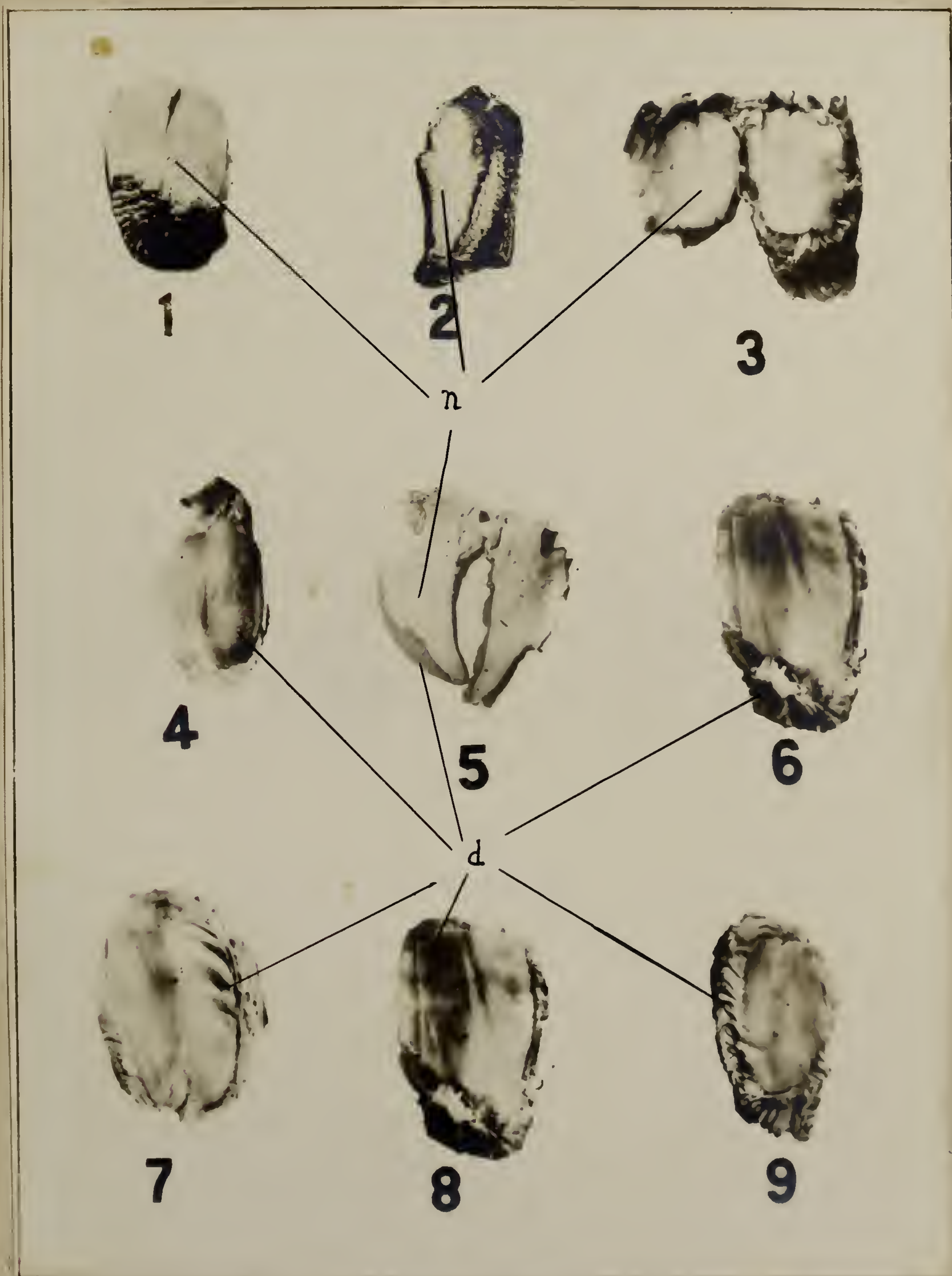

PLATE II.

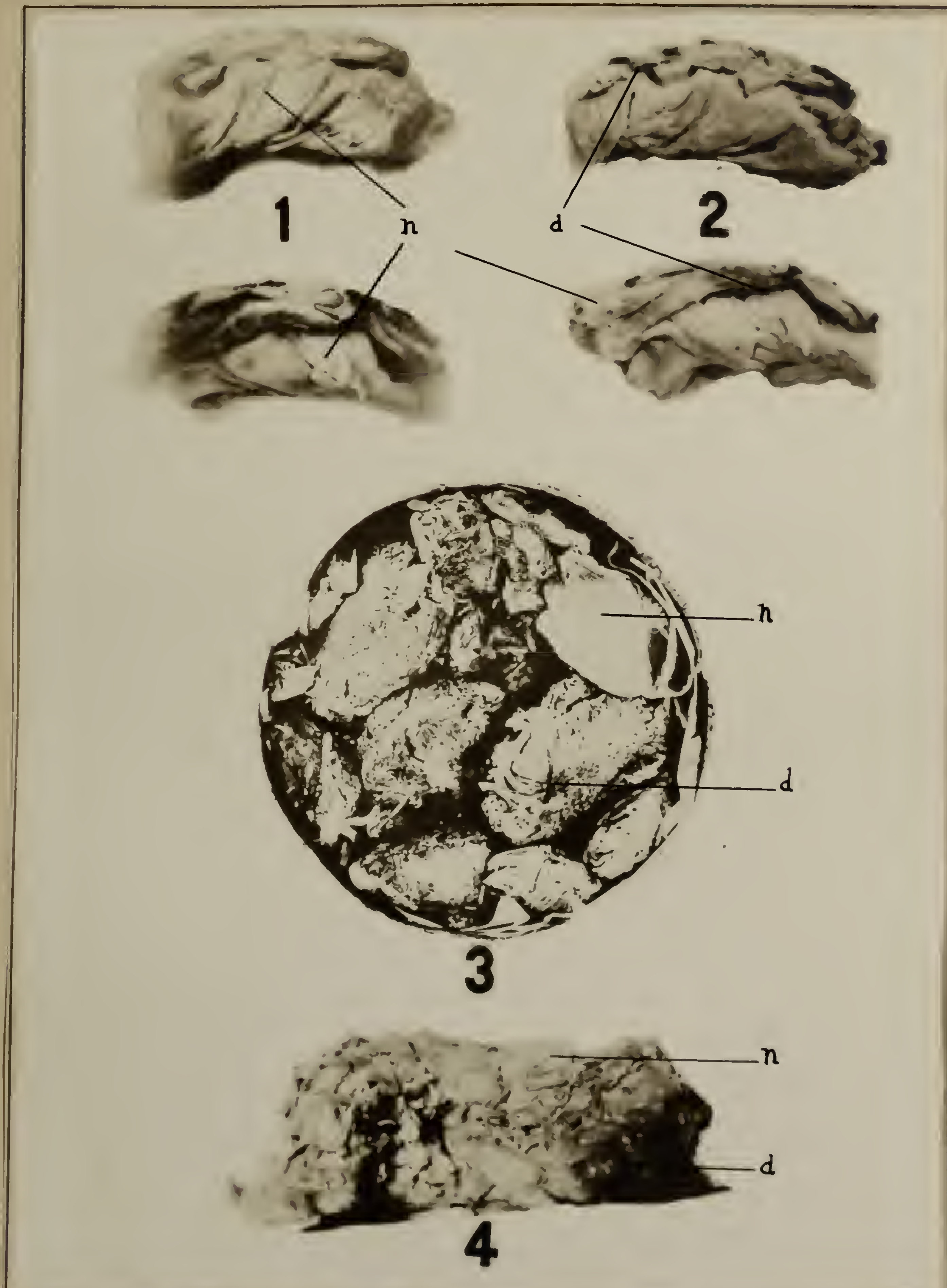

PLATE III.

2. Inky Black Chemical Discoloration of the Meat.

Where chemical discoloration on the interior of the can occurred only slightly, the can contents were not affected. However, in advanced cases where cans were badly discolored the meat and liquor were affected to such a degree that the product was unfit for consumption. Plate III, Figures 1 and 2 (d) show marked areas of discoloration in the tail meat taken from badly discolored cans. Experimental spring packs B, B1, E, E1, K, K2, N, N2, were typical of this type of discoloration. Figures 1 and 2 (n) show areas normal in color, but lacking in the keen bright color that characterizes good lobster meat.

3. Black Chemical Discoloration of the Paper Lining.

This form of discoloration was found to be due to deposits of iron sulphide. Where the interior of the can shows marked discoloration, the parchment lining became blackened, relative to the degree of black upon the interior of the tin.

4. Brown Chemical Discoloration of the Paper Lining.

Where oxide of iron was formed, due to the exposure of raw edges of iron, the linings coming in contact with this were of a yellowish brown cast.

5. Inky Black Chemical Discoloration of the Pickle.

Discoloration of the pickle was found to be due to the formation of large quantities of iron sulphide. The sulphide

was apparently dislodged from the can seams and surfaces and came immediately into contact with the pickle. In these cans finely divided, iron sulphide was visible giving to the liquor varying intensities of color. In advanced stages the pickle was inky black, in milder cases a dirty brown, varying in degrees to a normal pickle.

6. Brown Incrustation of the Can Interior.

This form of discoloration was found to be dependent upon the tightness of the can seams. Leaks and loss of vacuum result in an increased deposit of rust, which eventually leads to a black discoloration. It appeared that where air entered the can after processing, rust deposits formed which later turned black. Where this condition obtains in extreme cases, the head space often becomes coated with a thick layer of rust, more or less spotted, and of a dull dusty color, due to a partial change of the iron oxide to iron sulphide from the abundant sulphur normally present in the lobster. Figure II, Plate 1, shows a sanitary can top, but with no black discoloration about the seam of the can. In this kind of can the whole top appeared incrusted, and of a dirty greyish black color.

1. Inky Black Bacterial Discoloration of the Meat.

Plate II, Figures 1 to 9, illustrate portions of claw meat, showing typical discoloration from bacterial action, on the uncanned meat. Discoloration of this form appeared only after sterilization, as explained under causes producing

bacterial discoloration on page 66 . The material for the accompanying photographs was taken from experimental packs Q, Q4, S and P3. The light areas (n) represent normal lobster meat, while the outer darker areas (d) are typical of discolored meat.

Plate III, Figure 3, shows the interior of a four ounce can with normal (n) and bacterial discolored meat (d). Figure 4 shows the contents of a discolored can, produced by bacterial action previous to canning. Bacteriological examination of these cans showed no micro-organisms present.

Where this form of discoloration was prevalent, the claw meat was first and most seriously affected. The ends of the fibre bundles were first darkened, so that only the surface of the meat appeared dark; on breaking the remainder of the tissue looked normal. On standing after processing, or in more advanced cases, the complete bundles were blackened, and the whole claw became an inky mass.

In the tail meat discoloration occurred beneath the epithelial cells which comprise the epidermis. This region became first affected, and resembled claw discoloration, but usually to a less marked degree.

2. Blueing of the Meat.

Blueing is a form of discoloration which is considered even more objectionable than a small amount of black. Experimental packs R and J X showed that where lobster tissue becomes soiled with the blood and lymph, the typical blue color

appeared after sterilization. Blueing was found highly developed at the end of the great claw, and in the near neighborhood of the larger blood vessels.

3. Dull Yellowish White of the Meat.

In experimental spring packs A, A1, Q, Q4, Y, Y2, J X 8, and A8, there was exhibited in all the cans meat of a dull dead appearance. Although the meat was wholesome and possessed of the natural flavor of all good canned lobster, it could, however, not be classed as first quality meat. It has been found that where lobster meat becomes delayed in handling, or where dead lobster was used, conditions of this kind obtain.

4. Varied.

When a can of lobster is opened, the two most conspicuous kinds of discoloration are sulphide of iron and blueing, and as a general rule these are the only two kinds which an exporter objects to. There are, however, other kinds of discoloration which no careful buyer can afford to overlook, namely, patches of grey, or greenish brown. As time passes the color and taste of the meat becomes altered, so that the meat is unfit for food. In these cases the cause was found to be due to understerilization or leaky cans. However, the number of cans presenting this appearance was not great.

SEASONAL INFLUENCES ON DISCOLORATION.

In comparing the liquor of normal cans of lobsters, an apparent difference was found in the hydrogen ion concentration of the spring and fall pack. In the inspection data of the normal spring pack, the average hydrogen ion concentration of the liquor of sterilized cans was found to be 7.4, while in the normal fall pack the hydrogen ion concentration on the average was 6.6. Samples of meat tested before canning during the spring pack gave a distinct alkaline test with phenol red; similar samples of the fall pack were acid to the same indicator. In the experimental spring pack, packs B and B1, and of the experimental fall packs, packs B and B1, there will be found figures representative of this change. It was of particular interest to note that the PH of the cans was completely changed from the alkaline to the acid side of the PH scale. Since these differences were uniform, the only variation that could occur from the spring pack was the molting of the lobsters. It was necessary then to investigate this question.

The Question of Molting.

It is worthy of inquiry to know if there is any connection between the change of hydrogen ion concentration and the molting of the lobster, but before doing so, it will be necessary to discuss the details of the process by which the shell is cast.

All shell fish grow in stages. They are surrounded by a hard inelastic covering, and when in the process of growth

this covering becomes too small, it is cast off. This is known as molting. The process was well studied by Vitzou[1], in the marine laboratory of Roscoff, and by F.H. Herrick [2], in the laboratory of the United States Fishery Commission at Wood's hole, Massachusetts, from whose excellent report many of these physiological statements are taken. The shell of the lobster varies in hardness and color, depending upon the period since the last molt. An animal which has recently cast its shell is known to fishermen as a "soft shell", "new shell", "paper shell", or "buckle shell" lobster, and just previously to molting as an "old shell", "hard shell", or "black shell".

In Prince Edward Island it is unusual to obtain soft shell lobsters before the middle of July, at which time a few may be found in the traps with the cast off shell by their side, or the shell alone may be found, the animal having escaped by reason of its smaller size. The newly molted lobster lies limp and helpless, but is covered by a limiting membrane, resembling in shape at least in every respect the shell itself. Not only is the shell cast off but the lining of the stomach, oesophagus and intestine is exfoliated as well, these structures being derived from infoldings of the skin. Water is now quickly absorbed and the flesh converted into a

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[1] Vitzou, Recherches sur la structure et la formation des teguments chez les Crustaces Decapodes, Archiv. de Zool. Exper.et Generale, t. x., pp.451-576, pls. XXIII-XXVIII.

[2] Herrick, The American Lobster: A study of its habit and development. Bulletin of the United States Fish Commission, Vol. XV., 1895, pp.1.

pulpy mass. There is now a marked increase in size and a rapid hardening of the new shell.

Many factors go to account for this rapid growth of the shell. On each side of the stomach of a molting lobster are found two bodies, an inch long and half an inch thick, composed of calcareous matter and known as gastro liths. These bodies may be, as Vitzou suggests, "dissolved in the acids of the stomach and entering the lymph, form an inorganic reserve comparable to phosphatic plaques found in the membranes of the foetus in ruminants". On the other hand, Herrick may be right in holding that these gastroliths "represent the lime which has been removed by absorption from the old shell preparatory to the molt". But there is a more obvious source of supply of the calcarous matter necessary for the formation of the new shell. After molting the lobster is in the habit of swallowing fragments of shell, which are changed in the stomach to acid phosphates and thence carried by the blood to the locality where they are needed. It is difficult to say what period must elapse before the shell acquires any considerable degree of hardness. Reaumur[1], speaking of the cray-fish, says that he has seen the new shell become hard as the old in 24 hours, but that it usually requires from two to three days; and Chantran[2], referring to the same animal, says he has seen the shell resume its normal consistency in 40 hours.

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[1] Reaumur - Sur les diverses reproductions qui se font dans les ecrevisses, les omars, les crabes, etc., et entre autre sur celles de leurs jambes et de leurs ecailles. Mem. de l'Acad.Roy. des Sci., pp.226-245, pl.12.

[2] Chantran - Observations sur l'histoire naturelle des ecrevisses. Compt. Rend., t. 69, Pg. 43-45.

It would seem that, in the case of the lobster, there is considerable variation in the time required and that it is not marketable for at least a month.

Herrick is of the opinion that from six to eight weeks are necessary, under ordinary conditions, to produce a shell which is as hard as that cast off; and if lobsters were destined for the market they would probably be in a still better condition in ten weeks or three months. Many lobsters are caught and shipped to dealers a few weeks after they have molted, but their meat is then soft and of inferior quality. According to the opinion of a canner of lobsters, 7 pounds of soft-shelled lobster in summer or fall will yield no more than 4 pounds in spring when the flesh is more solid.

It is evident that in the process of molting, profound physiological changes occur, resulting in a change in the hydrogen ion concentration of the flesh.

It is not within the scope of the present investigation to determine chemical changes producing an alteration in the hydrogen ion concentration. It is essential to know, however, that such a change does occur, and that the final hydrogen ion concentration of the can is effected, which has a very direct bearing upon the quality, discoloration of the meat and of the can.

To further prove this existing change in the hydrogen ion concentration, a series of cans were packed to determine if the change in the meat was local or general, or if a difference could be detected between hard and soft shelled lobsters during the molting season.

Experimental Pack Z and Z3.

Packed Aug. 31, 1921.

No.of cans, 24.

For this pack only soft shelled lobsters were used. They were handled commercially and picked from the cooling tables. The tail and the claw meat were kept separate.

12 cans marked Z were packed with tail meat.

12 cans marked Z3 were packed with claw meat.

All cans were boiled at 212°F. for 2½ hours.

Experimental Pack W and W3.

Packed Aug. 31, 1921.

No.of cans, 24.

This pack contained only hard shelled lobsters. Handled as in Z and Z3.

12 cans marked W were packed with tail meat.

12 cans marked W3 were packed with claw meat.

Experimental Pack W32 and Z32.

Packed Aug. 31, 1921.

No. of cans, 24.

In pack W32 only arm meat from supposedly hard shelled lobsters was used.

In pack Z32 only arm meat from soft shelled lobsters was used.

All was boiled at 212°F. for 2½ hours.

Results of PH Findings.

Pack	Average PH of cans.
Z	6.6
Z3	7.2
W	6.6
W3	6.2
W32	7.2
Z32	7.4

These figures indicate that where the mixed meat of the lobster was packed, sufficient acid was present to render the contents of a normal pack on the acid side of the PH scale.

Further proof of a change in the hydrogen ion concentration of fall packed cans will be found in the following table:-

Table V.

Packers No.	Factory at	Size of can.	PH
I	Borden	4 ounce	6.4
2	Summerside	"	7.2
3	Emmore River	"	7.6
4	Chelton	"	6.6
5	Victoria	"	6.6
6	Tyron	"	6.6
7	Victoria	"	7.4
8	Abraham's Village	"	7.2
9	St. Chrysostome	"	6.6
IO	Victoria	"	6.6
II	Cape Traverse	"	6.6
I2	Cape Traverse	"	6.6

The above cans were collected and supplied by the Inspector of Fisheries for Prince Edward Island. They were received on December I2th., I92I, and examined on that date.

It will be found in the above table that of the twelve cans examined, four showed a reversion to alkalinity. It is the belief of the writer that during the later part of the fall season, the cans again become alkaline owing to the completion of the molting of the lobsters. Unfortunately no dates of packing accompanied the cans, so that final conclusions cannot be drawn.

The importance and part of an acid reaction in canned lobster will be brought out more fully under the heading of chemical influences on discoloration.

EFFECT OF DIFFERENT WEIGHTS OF TIN COATING.

A matter which appeared to be of great importance has been carefully considered, that is, whether a saving in lobsters could not be effected by the introduction and use of a can with a much superior quality of tin plate than that now used in the industry. For several years packers have held the opinion that much of the difficulty with discoloration could be avoided by using a plate with a heavy coating of tin. Experiments were, therefore, made with the view of determining if the quality of the plate had any such influence.

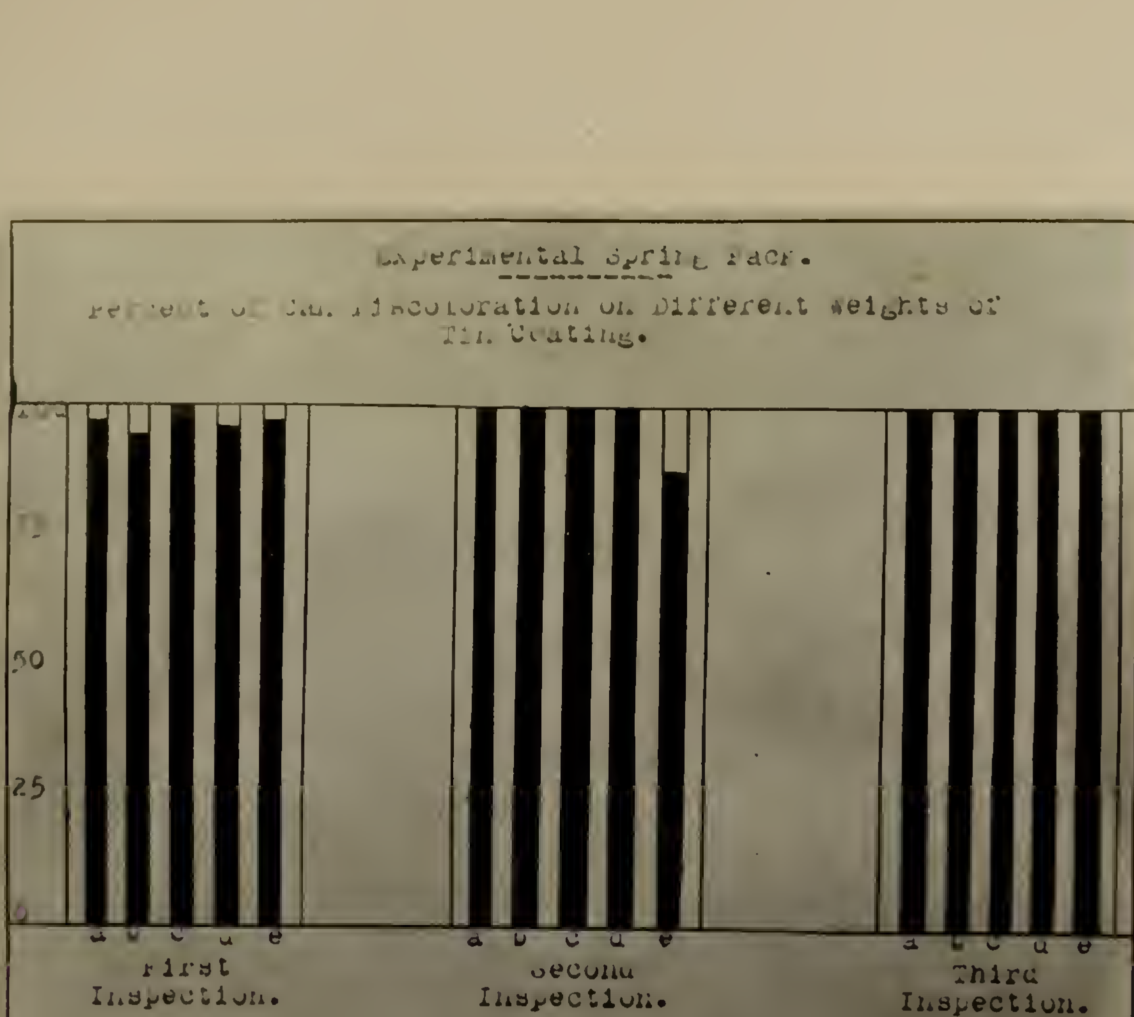
During the experimental fall and spring pack, a large number of cans representing the five grades of tin plate were packed.

Experimental packs: B, B1, E, E1, K, K2, N, N2, P, P3, S and S5; and B, B1, E, E2, N, N2, X and X1, are representative of the spring and fall seasons respectively.

The results of the various grades of tin plate on discoloration of the can are taken from the spring and fall inspection data, and will be found in plots I. and II.

Experimental Spring Pack.

Percent of Can Discoloration on Different Weights of Tin Coating.



a- 1.5 pounds of tin per base box.

b- 2.0 pounds of tin per base box.

c- 2.5 pounds of tin per base box.

d- 3.0 pounds of tin per base box.

e- Enamel can.

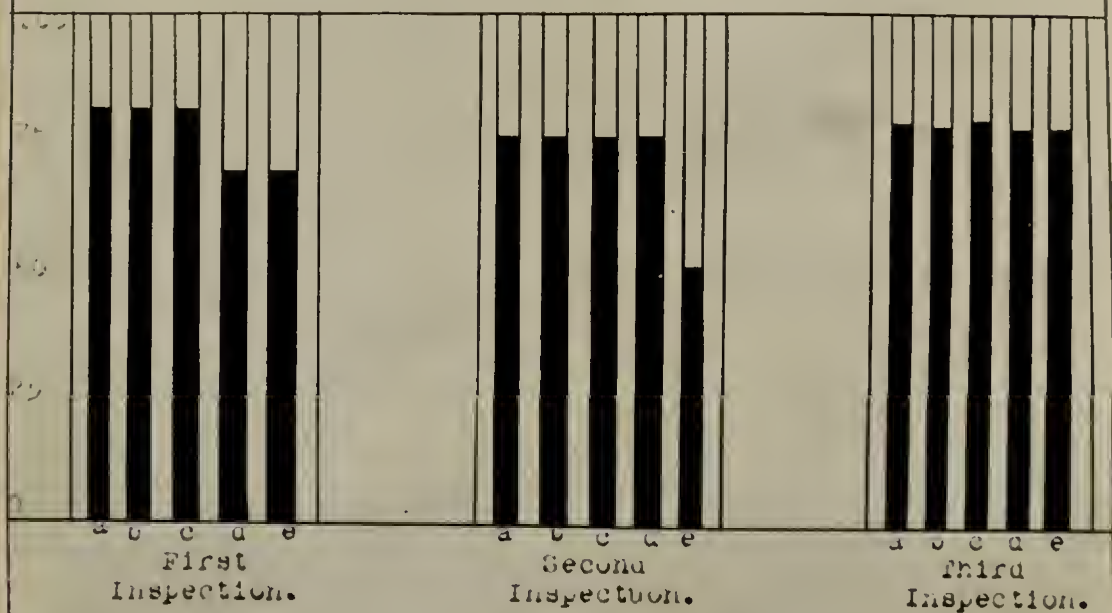
▮- discoloration.

This plot shows the comparative percentages of can discoloration for each weight of coating at each of the three inspections of the spring experimental pack.

Plot I.

Experimental Fall Pack.

Percent of Can Discoloration on Different Weights of Tin Coating.



a- 1.5 pounds of tin per base box.

b- 2.0 pounds of tin per base box.

c- 2.5 pounds of tin per base box.

d- 3.0 pounds of tin per base box.

e- enamel can.

█- discoloration.

This plot shows the comparative percentages of can discoloration for each weight of coating at each of the three inspections of the fall experimental pack.

Plot II.

CHEMICAL INFLUENCES ON DISCOLORATION.

The accompanying figures show a comparison of the hydrogen ion concentration of the liquor of various canned foods.

Food.	PH.
Corn	6.04
Evaporated Milk	5.77
Tomatoes	4.09
String beans	4.94
Peas	5.75
Apples	2.88
Pumpkin	4.79
Spring lobsters	7.40
Fall lobsters	6.60

From the above figures it is apparent that in practically all canned foods the reaction is acid, while in lobsters of the spring pack it is alkaline, and of the fall pack acid.

This point is worthy of consideration from the standpoint of the degree of discoloration, as contrasted between the spring and the fall pack.

While discoloration may occur in acid foods, it appears never to be so serious as in foods with an alkaline reaction as in canned lobsters. This has been previously explained by the fact that where hydrogen sulphide is liberated in an acid medium black sulphide does not form to such a marked degree, owing to the solubility of the sulphide in a weak acid.

To determine then the influence of an acid reaction on discoloration in canned lobsters, the following experimental packs were made:- Packs C, C1, D, D1, H, H2, L and L2, and packs B, B1, D, D2, L, L2, S, S2, T and T2 are representative of the spring and fall seasons respectively.

Figure I shows the effect of the normal and adjusted PH on discoloration on the interior of the can of the spring pack.

Figure 2 shows the effect of the normal and adjusted PH on discoloration on the interior of the can of the fall pack.

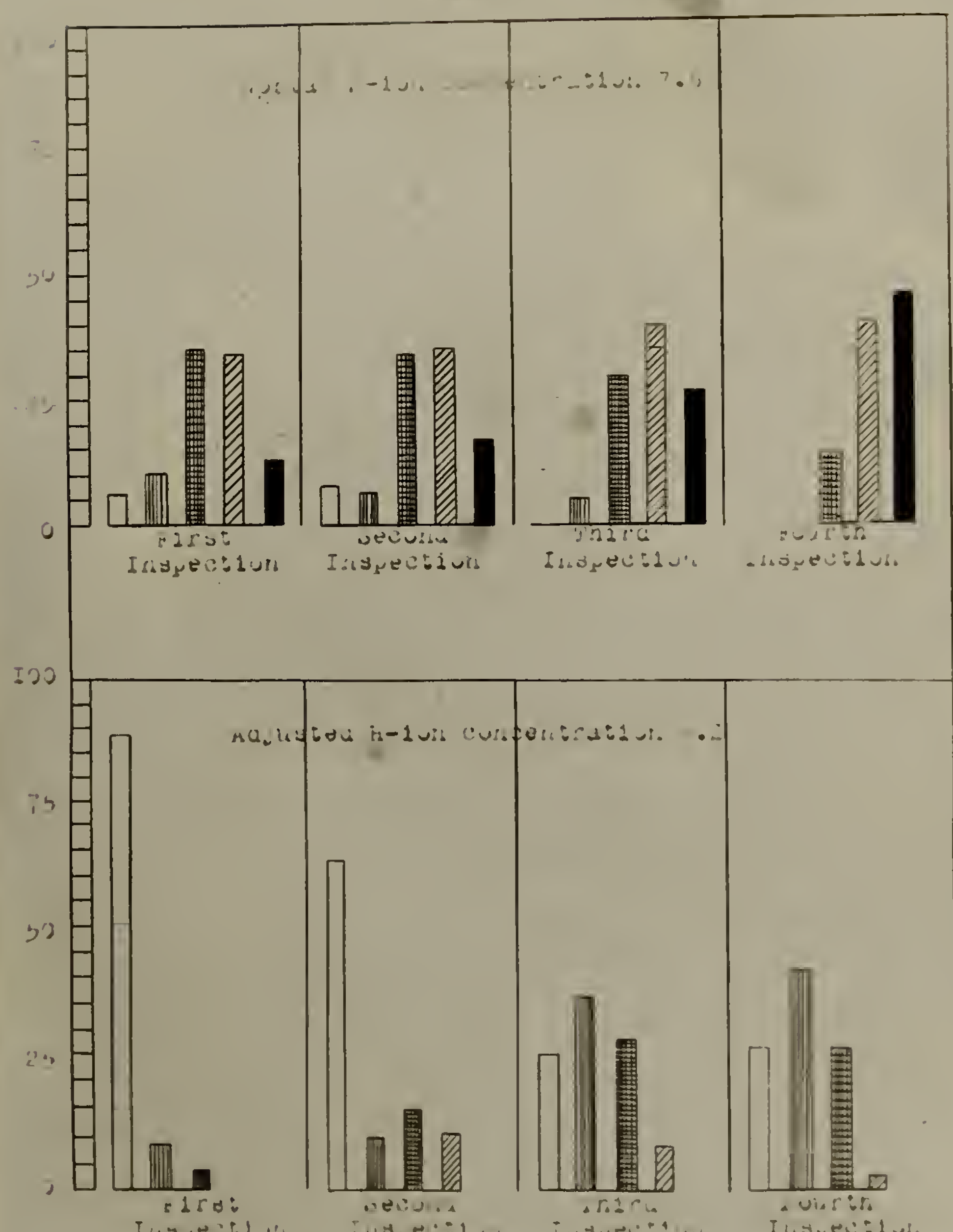
Figure 3 shows discoloration on the interior of the can of normal fall lobsters with an acid reaction of PH 6.6 adjusted by the addition of normal sodium hydroxide to PH 7,4,

Figure 4 shows the effect of the adjusted PH contrasted to the normal on the lobster meat of the spring pack.

Figure 5 shows the effect of the adjusted PH contrasted to the normal on the lobster meat of the fall pack.

Figure 6 shows discoloration of the meat of normal lobsters of the fall pack with an acid reaction of PH 6.6 adjusted by the addition of normal sodium hydroxide to an alkaline reaction.

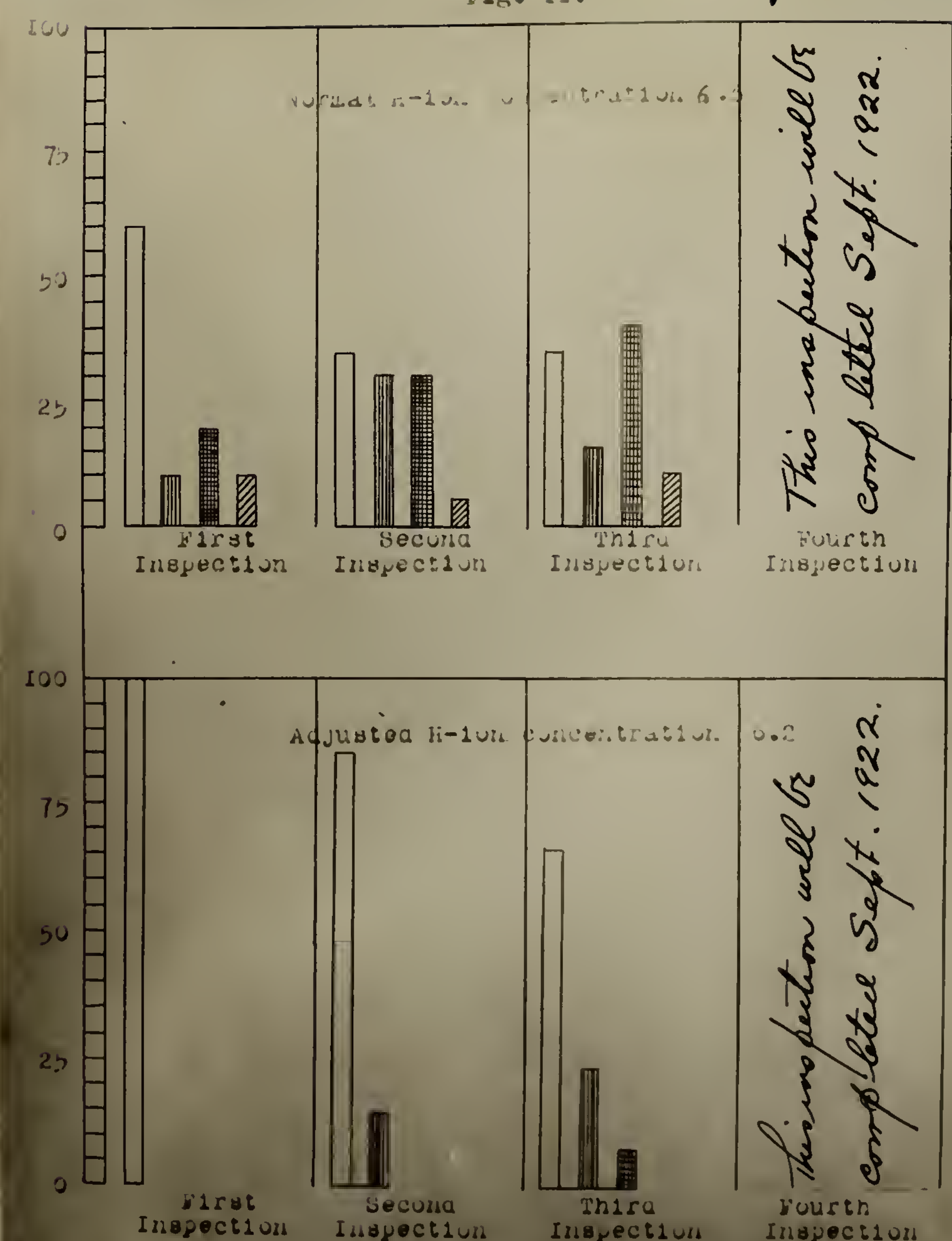
Fig. I.



This plot shows graphically the spring pack inspection data on discoloration of the interior of the can, with normal and adjusted pH. values. The percentage of the total number of cans graded as None, Trace, Slight, Bad and Very bad are represented by the lengths and shadings of the columns according to the key. None

Trace Slight Bad Very bad

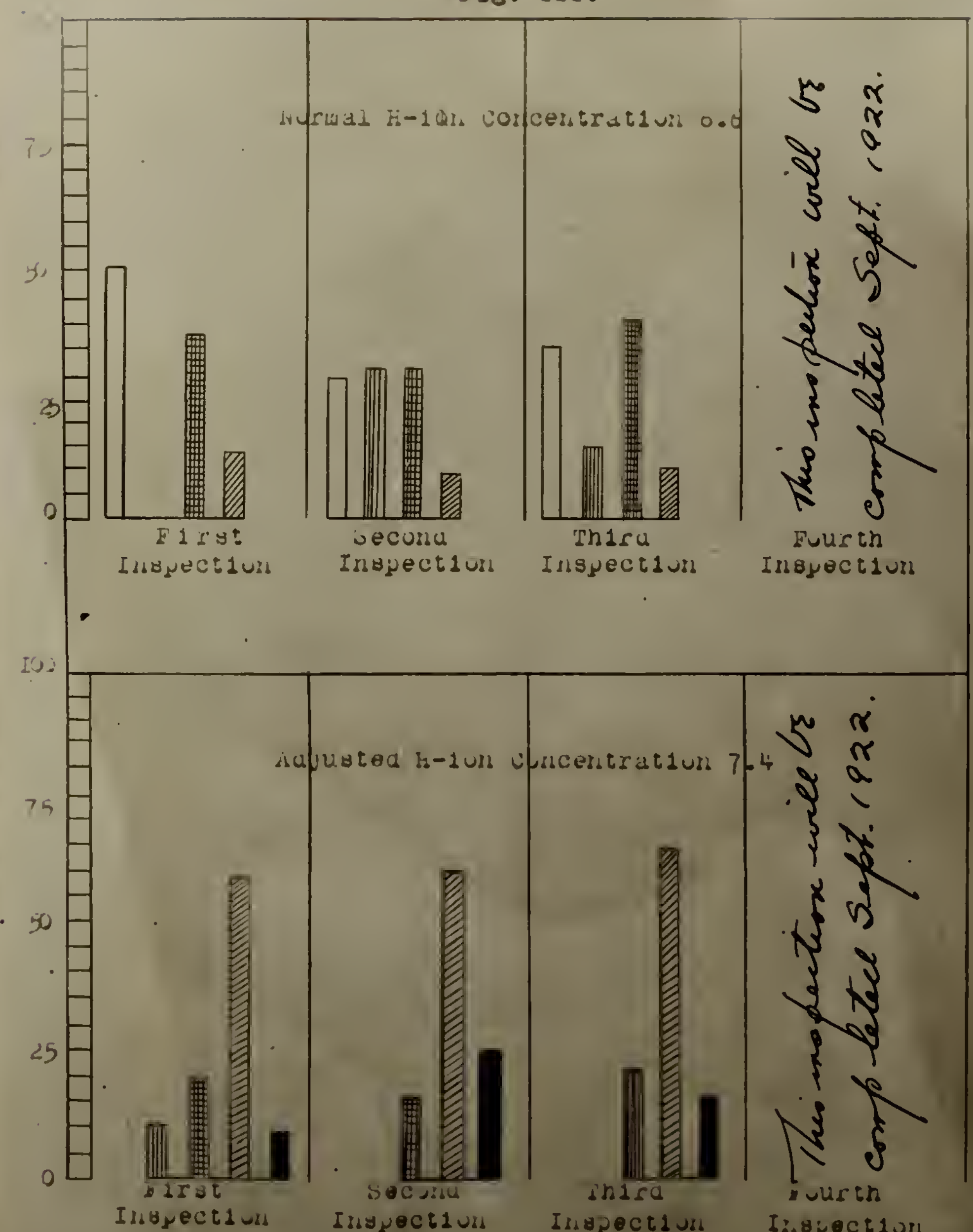
Fig. II.



This plot shows graphically the fall pack inspection data on discoloration on the interior of the can, with normal and adjusted p.H. values. The percentage of the total number of cans graded as None, Trace, Slight, Bad and Very Bad are represented by the lengths and shadings of the columns according to the key.

None Trace Slight Bad Very Bad

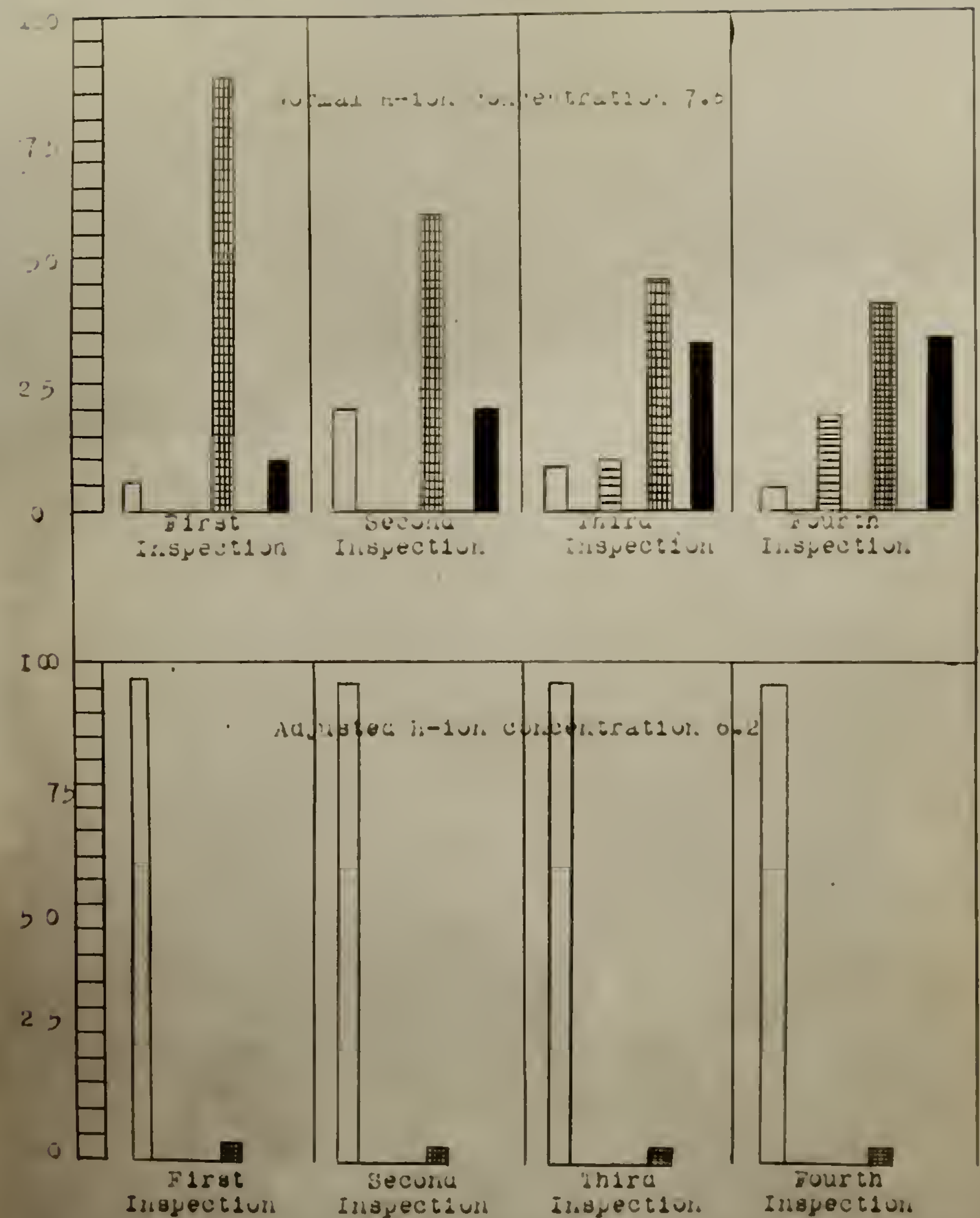
Fig. III.



This plot shows graphically fall pack inspection data on discoloration of the can interior with a normal P.H. of 6.6 adjusted to P.H. 7.4.

None Trace Slight Bad Very Bad

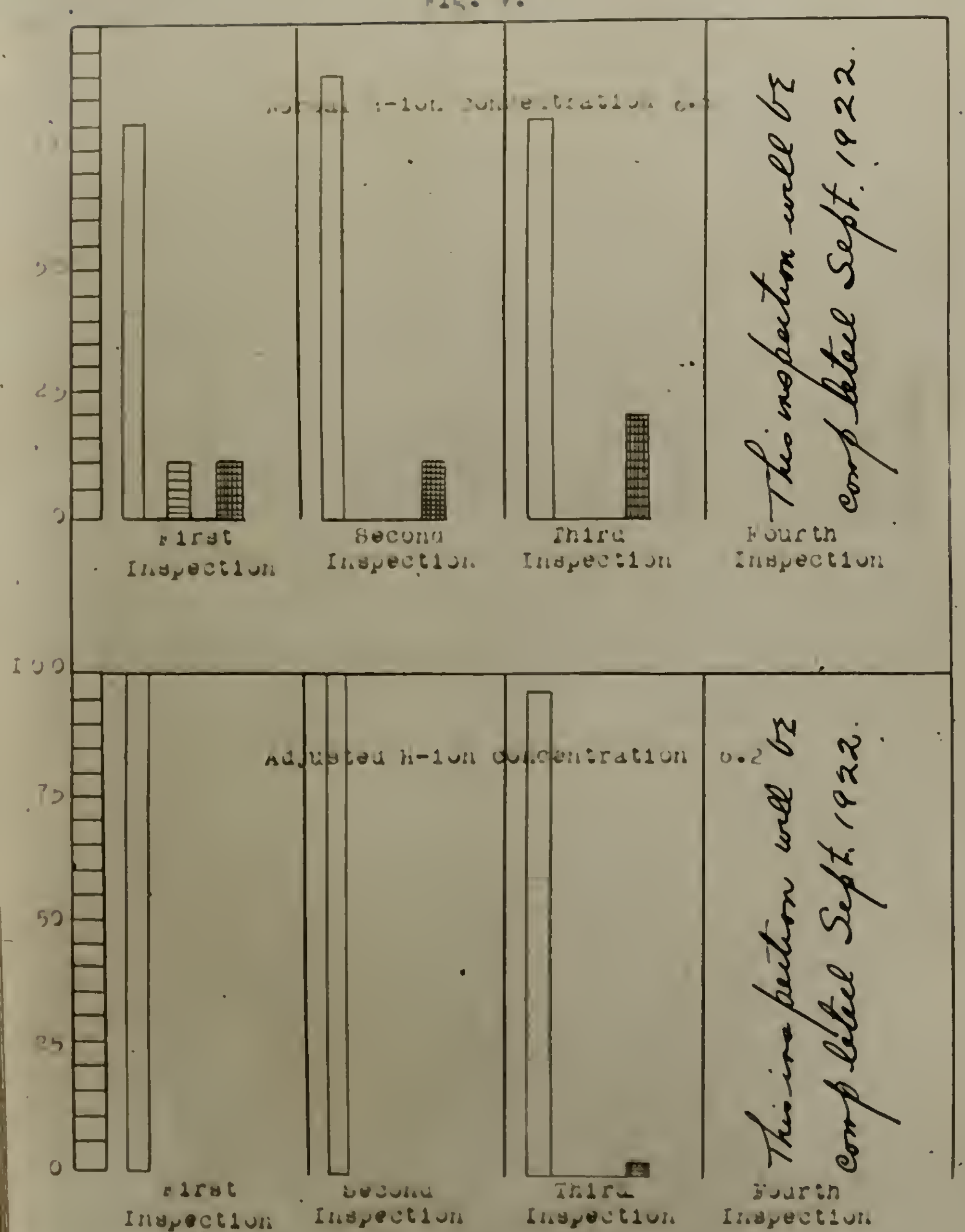
Fig. IV.



This plot shows graphically the spring pack inspection data on general appearance of the meat with normal and adjusted P.H. values according to the key.

Normal Dead Slight Discoloration Marked Discoloration

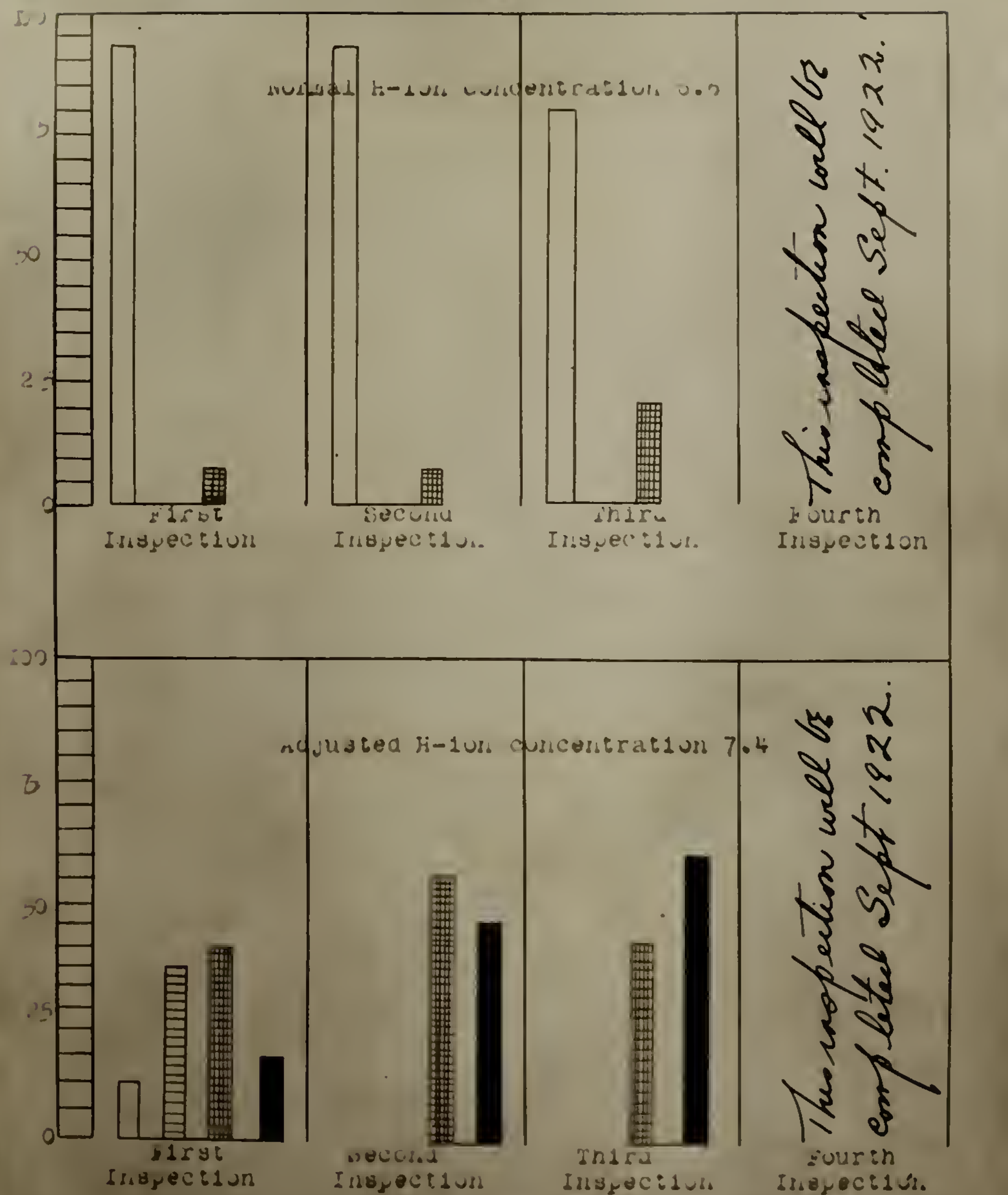
Fig. V.



This plot shows graphically the fall pack inspection data on general appearance of the meat with normal and adjusted P.H. values, according to the key.

Normal Dead Slight Discoloration Marked Discoloration

Fig. VI.



This plot shows graphically fall pack inspection data on the general appearance of the meat with a normal P.H. of 6.6 adjusted to P.H. 7.4.

Normal Dead Slight Discoloration Marked Discoloration

BACTERIAL INFLUENCES ON DISCOLORATION.

Experimental packs P3, R, J X, Q and Q4 of the spring season have shown clearly that bacteria were involved in the production of discoloration in canned lobsters. As pointed out under causes of discoloration, this type was found to be due to the action of bacteria on the lobster tissue previous to canning, and produced only after sterilization, in a pickle of PH 7.4. To determine the influence of an acid pickle, on the development of discoloration, the following experiment was planned.

On May 28th., 1921, lobsters were taken from the regular catch and placed in cages, and sunk in clear water in a tideway. On the morning of the 30th., they were taken from the traps dead. The meat was then packed commercially. To one half of the cans normal pickle was added and to the remainder, adjusted pickle was added. The final reaction of the cans were PH 7.4 and 6.2 respectively. Examination at the regular inspections showed in the case of the acid reaction a marked improvement in many cans, but lack of uniformity throughout the total pack. While the quality of the lobster was much better than that of the alkaline pack, it is not to be recommended as a panacea for carelessly handled lobsters.

HEAT PENETRATION

Basis of Study.

Successful preservation of lobsters, as in any canned food, is dependent upon the elimination of micro-organisms through heat as a sterilizing agent. It is, therefore, of paramount importance to know just what temperatures and processing periods will destroy micro-organisms special to this class of food. On the other hand it is important to know if the cause or agents of discoloration can be eliminated by complete sterilization. If such sterilization is to be thorough, a sufficient degree of heat must penetrate to all parts of the can and must remain long enough to kill all forms of life. Before an accurate length of time can be stated, it is necessary to know the number of minutes required for the food at the centre of the can to reach the temperature of the retort or water bath in which it is being processed.

In the work here reported, attention has been centred upon these time-temperature relations, with a two-fold purpose: First, to eliminate the factor of understerilization as a possible cause of discoloration. Secondly, with the purpose of laying down some definite rules of procedure for use in commercial plant practice, accurate scientific measurements are absolutely necessary.

Review of Literature

Bigelow[1] in 1920, and Magoon and Culpepper[2] in 1921, have brought up to date the literature of the subject of heat penetration in canned foods. In their reports they include the historical and most recent development of heat penetration, methods and apparatus employed. Their reports embrace a study of a variety of canned foods. However, so far as the writer knows, no data is at present available on the heat penetration of canned lobsters.

Apparatus

The thermocouples used in the investigation were constructed of copper and constantan wires. The writer is greatly indebted to Prof. G.F. Taylor of the Bureau of Plant Industry, Washington, by whom the couples were prepared. The constant junction was located in the thermos-bottle, maintained at 0°C., by means of an ice and water mixture, and the variable junction was placed in the centre of the can of material under test. The potential was measured with a Leeds and Northrup type K. potentiometer, and an enclosed lamp and scale galvonometer. For pressure and water bath determinations a National Junior No.1 canner, manufactured by the Northwestern Steel and Iron Works, Eau Claire, Winconsin, was used. Figure 1 shows the apparatus assembled, Figure 2 an individual thermocouple showing the cold

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1. Bigelow: Heat Penetration in Preserving Canned Foods. Bulletin No. 16-E., National Canners Association, Washington, D.C.

2. Magoon and Culpepper: A study of the Factors affecting Temperature Changes in the Container during the canning of Fruits and Vegetables. U.S. Department of Agriculture, Bulletin No. 956.

Apparatus Employed in the Determination of

Heat Penetration in

Canned Lobsters.

Fig. I.

I. Pressure Cooker.

2. Thermocouples.

3. Thermosbottles.

4. Weston Standard Cell.

5. Resistance Coil.

6. Potentiometer.

7. Storage Cell.

8. Galvanometer.

9. Switch.

Fig. II.

Fig. III.

junction, and electrical wire leads. Figure 3 shows thermocouple attached to the can by means of a steam tight joint.

Time-Temperature Curves

While the pressure sterilizer employed is not of the large commercial type, the curves obtained are, nevertheless, applicable to commercial conditions. The time-temperature curves following were carried out under factory conditions at North Rustico, Prince Edward Island.

From answers in the questionnaire, 99 percent of the canneries used the open bath method of sterilization, for continuous periods of time varying from 2 to 3¼ hours. As heat penetration plays just as important a part in the continuous method as under pressure conditions, and as the industry is based at the present time upon the former methods, time-temperature curves representative of commercial conditions will first be discussed.

Figure 1 shows time-temperature relations for lobsters in 6 percent salt pickle when processed in 4 oz cans in a water bath held continuously at 212°F. The curve represents the rise in temperature during processing at intervals of five minutes. It is to be observed that the temperature rose comparatively slowly, and only after 30 minutes heating was the centre of the can at the same temperature as that of the water bath.

Figure 2 shows time-temperature relations for lobsters in 6 percent salt pickle when processed in 7 oz. cans in a water bath held continuously at 212°F. The temperature of this can rose somewhat slower than in Figure 1, and only after 40 minutes heating was the centre of the can at the same temperature as that

of the water bath. While only a difference of 10 minutes exists between a 4 and 7 oz. can, it is nevertheless important for sterilization that a longer period should be allowed for the 7 ounce than the 4 ounce can.

Figures 3 and 4 show time-temperature relations as influenced by the initial temperature of the can. In most canning operations the contents of the can are heated before the can is sealed, In lobster canning the meat is packed and sealed cold, usually at a temperature ofbetween 60 and 70°F.

Turning to the heat penetration curves, in Figure 3 we find that starting at 64°F. the temperature of the can was reached in 30 minutes, at 150°F. the temperature of the can was reached in 20 minutes, and at 186°F. the temperature was reached in 15 minutes. It is apparent from this, that where the initial temperature approximates that of the bath temperature, the sooner was the can at the same temperature as that of the bath. In other words, where food is preheated or exhausted and sealed hot, the heat penetration time was much shorter and of less importance than in foods packed at room temperature. In that, the lobster pack does not lend itself to preheating, and as this preliminary operation contributes materially to the processing, a period of 30 minutes should elapse in the case of a 4 ounce can, before sterilization time is taken. In Figure 4, with an initial temperature of 68°F. in a 7 ounce can. the temperature was only reached after a period of 40 minutes.

In Figures 5 and 6 are shown the heat penetration curves of the centre of a 4 and 7 ounce can of lobsters in 6 percent salt

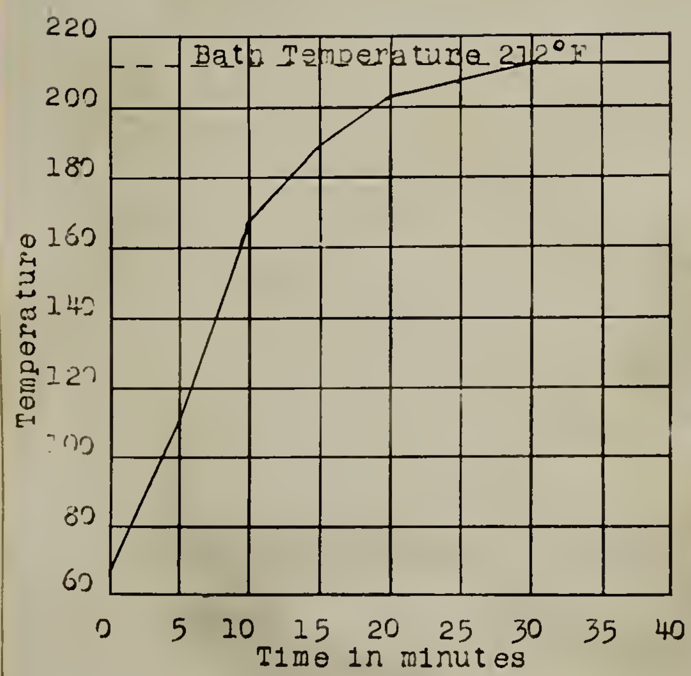


Fig. 1. Lobster in 4 oz. cans; normal pack; normal pickle.

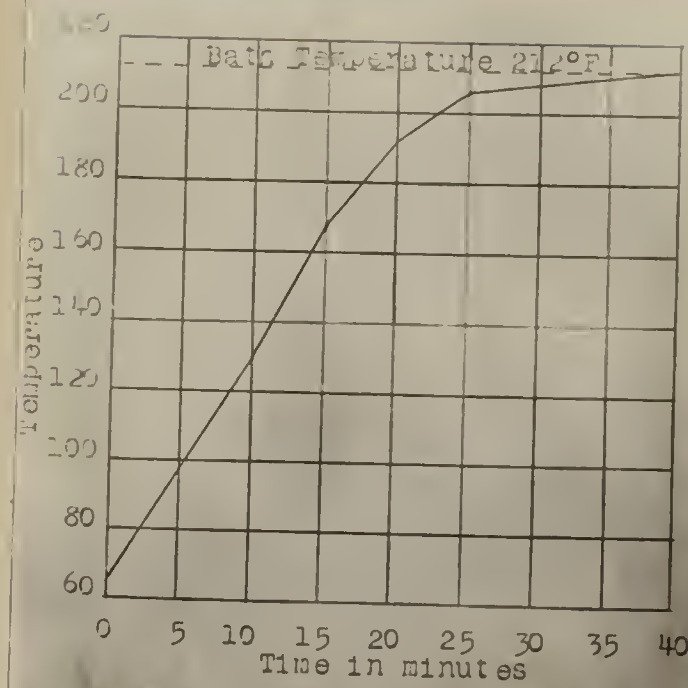


Fig. 2. Lobster in 7 oz. cans; normal pack; normal pickle.

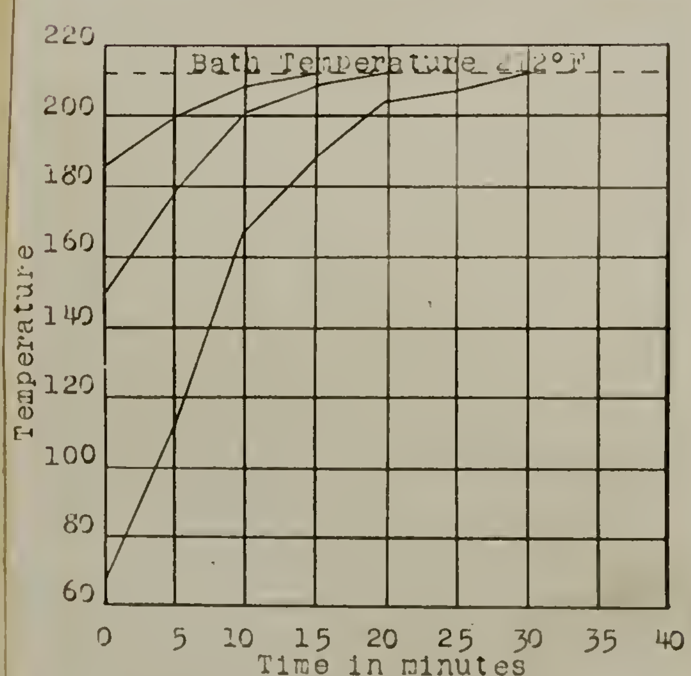


Fig. 3. Lobster in 4 oz. cans; influence of initial temperature.

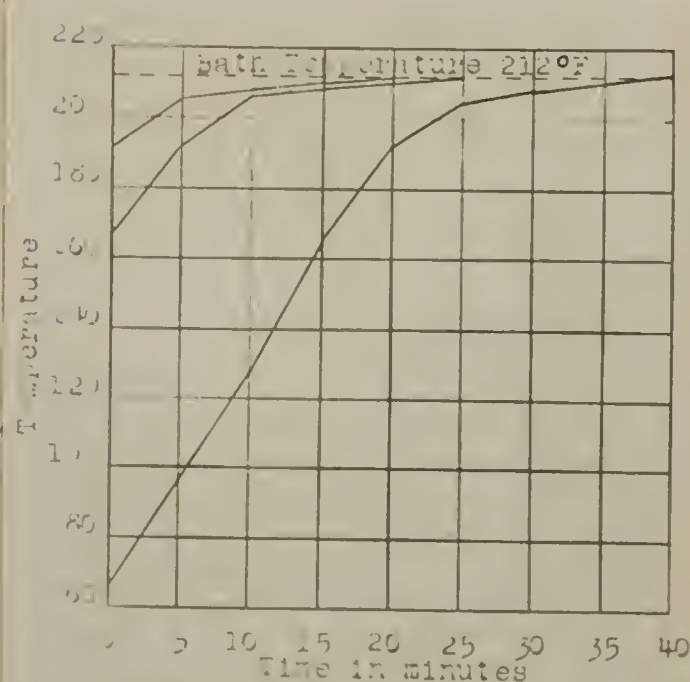


Fig. 4. Lobster in 7 oz. cans; influence of initial temperature.

solution, processed under pressure. In both cases retort temperature was up in 10 minutes. Here the temperature rose quite quickly as compared with the curve in Figures 1 and 2, and it might have been expected that the heat would penetrate rapidly to the centre of the can. However, after the first minutes, the curves show a lag and the temperature rose comparatively slowly, and only after 25 and 30 minutes respectively were the 4 and 7 ounce cans at the required temperature for sterilization.

The influence of initial temperature on the heat penetration of lobsters in 4 and 7 ounce cans is shown in Figures 7 and 8. The retort was brought to temperature in 10 minutes. As in Figures 3 and 4 it is apparent that where the initial temperature approximates that of the bath temperature, the sooner was the can at the same temperature as that of the bath. It is evident from the curves that the initial temperature is influential on the time of the final sterilization.

Figures 9 and 10 represent normal packs, as carried out in commercial canning plant practice. In many canning factories, no pickle is added. It will be observed from the curves that no apparent differences are present from the normal pack with pickle. Where meat is washed, and packed supposedly dry, considerable moisture is always present, and the movement of convection currents are still permitted as under normal conditions. Where such conditions obtain, heat penetration is not retarded.

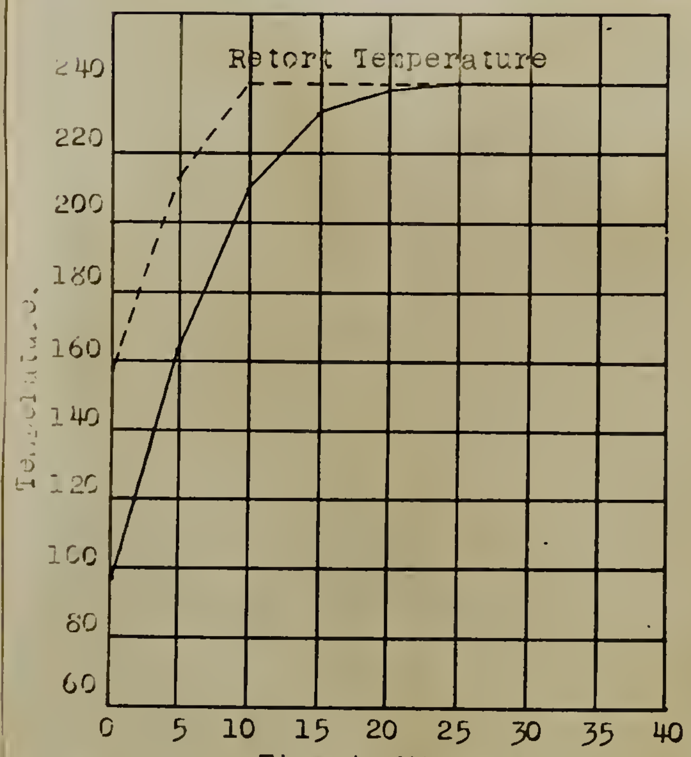


Fig.5. Lobster in 4 oz. cans; normal pack; normal pickle.

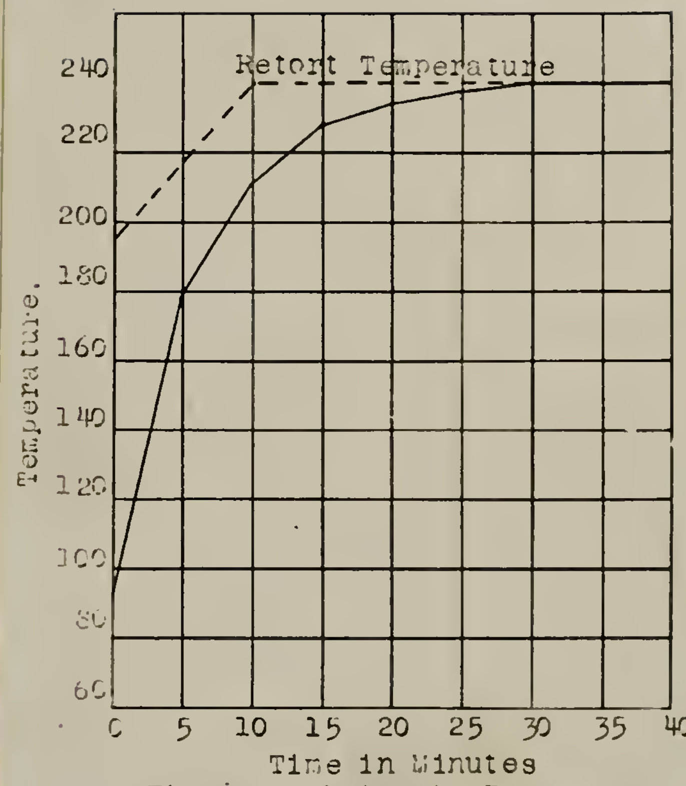


Fig.6. Lobster in 7 oz. cans; normal pack; normal pickle.

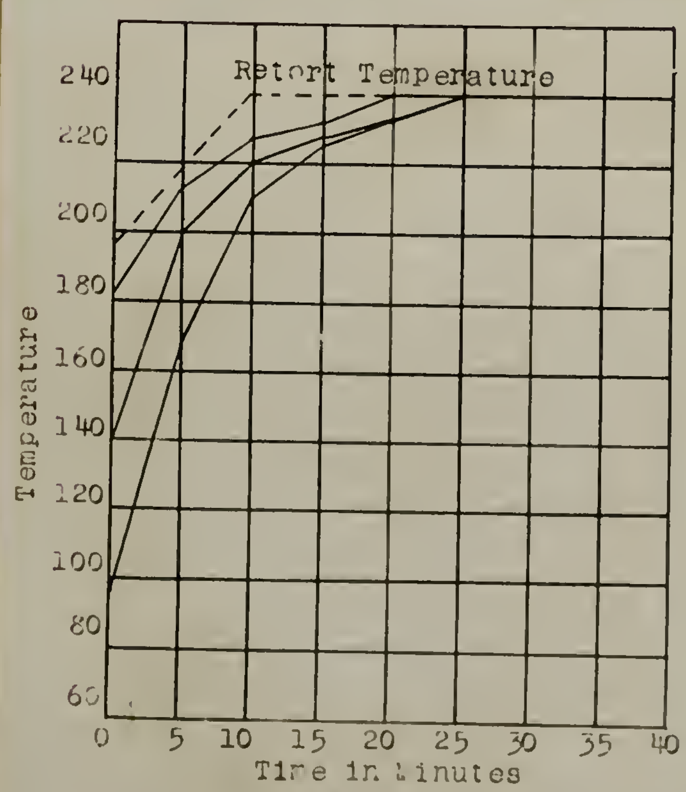


Fig.7. Lobster in 4 oz. cans; Influence of initial temperature.

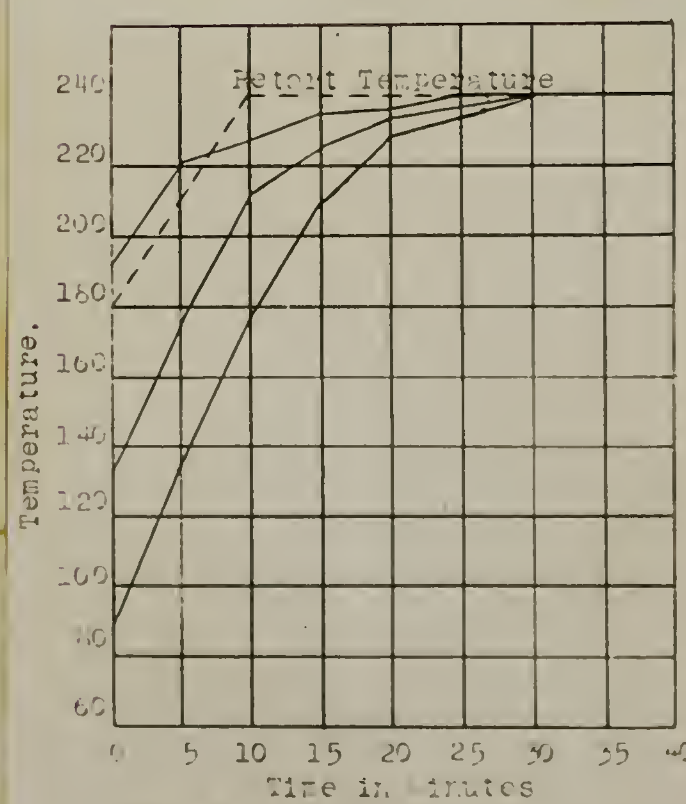


Fig. 8. Lobster in 7 oz. cans; Influence of initial temperature.

With the increasing use of the lacquered sanitary can in some plants, fewer parchment lined cans are employed. It would appear from Figures 9 and 10 that the parchment lining acted as a non-conductor of heat, resulting in a slightly slower heat curve than under normal conditions. Commercially this is not serious.

Where twice the quantity of pickle was used, the curve rose more rapidly than the normal. However, no apparent difference was observed in the final heat penetration curve from the normal pack.

Figure 11 gives time-temperature curves of the lobsters in 16 ounce flats, and 16 ounce talls, processed at 240°F. Retort temperature was up in 10 minutes. It is evident from these curves that the size of the can influences greatly the time required to heat its centre to a given temperature. Bigelow has shown this point, and has formulated a heat penetration table for cans of different sizes. It is seen that the difference between the heat penetration of a 7 ounce and a 16 ounce is very great. To bring the centre of a 16 ounce flat or tall can to retort temperature, it required between 30 and 35 minutes longer than for a 7 ounce can, so that this difference measures the relative length of process necessary in the two sizes of cans.

The heating curve of the 16 ounce can in Figure 12 is interesting as it applies to present day factory methods much more so than in Figure 11. There the bath is kept constantly boiling at a temperature of 212°F. the heating curve rises gradually

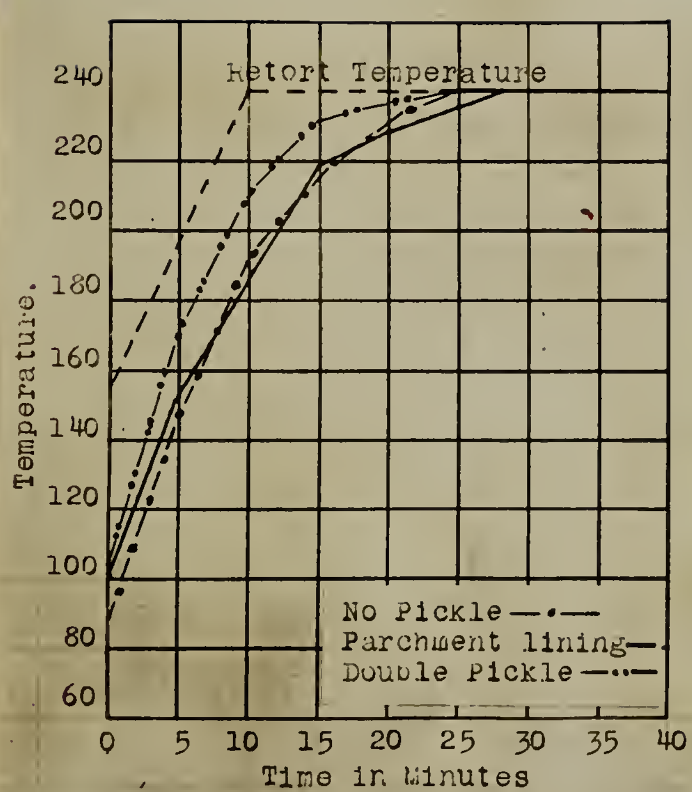


Fig.9. Lobster in 4 oz. cans.

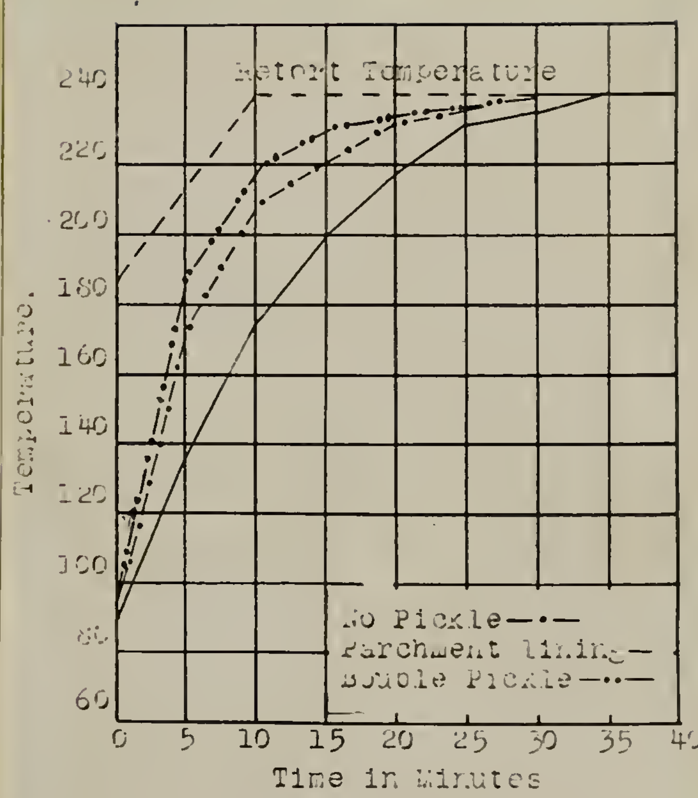


Fig.10. Lobster in 7 oz. cans.

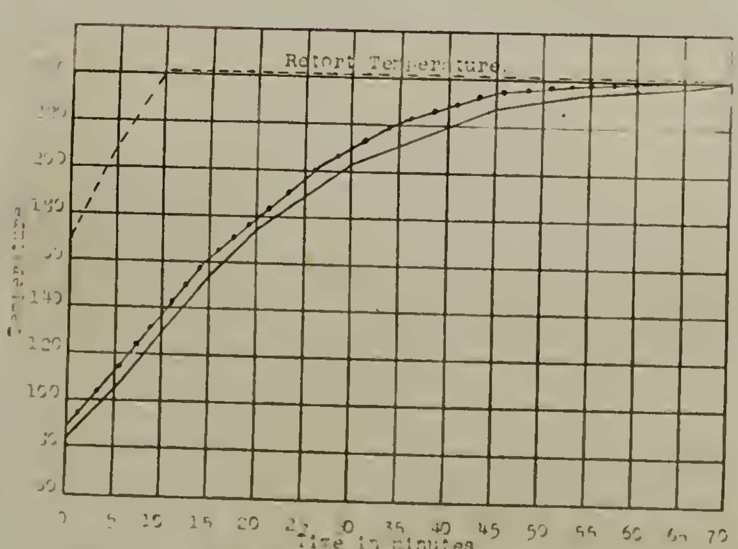
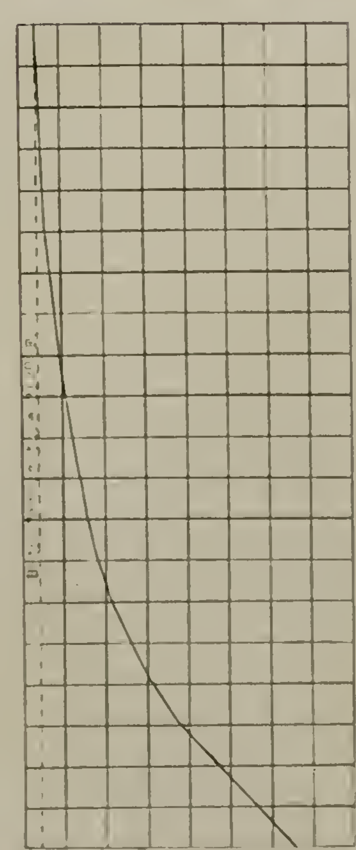


Fig.11. Lobster in 16 oz. Flats; normal pack; normal pickle. ——
Lobster in 16 oz. Talls; normal pack; normal pickle. —•—



during the first hour, and reaches a temperature of 202°F. The remainder of the curve shows a marked lag and only after 40 minutes continued heating has the temperature reached that of the bath. Under commercial practice, where cans are placed in the bath in large numbers, and at room temperature, and where vigorous boiling is not practised, frequently much time is lost before the bath reaches 212°F. In many canneries the time of sterilization is taken immediately after the cans are in, so that the sterilization period is much shorter than supposed by the operator. The importance of vigorous boiling is not realized by all packers, and it is questionable in many cases, where cans are allowed to simmer, if the temperature of the interior of the can ever reaches a temperature as high as 212°F. Where most ideal conditions obtain, the heat penetration in a 16 ounce can is comparatively slow, where conditions offset this a longer time is necessary for complete sterilization and varies with the individual operator.

Heat Penetration and Sterilization.

It should be clearly understood that the temperature at the centre of the can is only one of the factors involved in sterilization. It is equally important to know the time required at a definite temperature to destroy resistant organisms peculiar to lobsters, and under varying conditions of packing. It is also necessary to bear in mind the effect of heat on the final product. On the next page, heat penetration will be discussed in its relation to thermal death points of organisms, and its effect upon the final product.

Thermal Death Points of Spore-forming Bacteria in Their Relation to Sterilization.

Inspection data of the spring and fall experimental packs have shown that at least 80 percent of the discoloration was due to chemical agencies. The remainder of the discoloration was due to bacterial action on the meat previous to canning, understerilization and leaks. It is evident, therefore, that the part played by bacteria in producing discoloration in canned but unsterile lobster is very negligible. However, the question of sterilization still remains one of importance and thorough sterilization should be the goal in canning lobster as in any other canned food. With this in mind, no attempt has been made to study exhaustively the different species of bacteria isolated from normal and discolored cans. With a view of arriving at thorough sterilization, the thermal death point of these organisms has been carefully studied, both under laboratory and factory conditions.

Table VI. gives a brief classification of the organisms, according to source, morphology and spore formation.

The thermal death points of the spore forming organisms vary from 3 to 5 hours at a temperature of 100°C., many of the organisms survived 122°C. for 10 minutes, all were killed, however, at this temperature for 15 minutes.

TABLE VI.

No.	Source.	Morphology.	Spores.	Thermal death points of spores. Mins. at 100°C.	10 mins.at 122°C.	15 mins.at 122°C.
101	Normal can	Rods	Present	260 to 265 mins.	Not Killed	Killed
102	Discolored can	"	"	290 " 295 "	" "	"
103	Normal "	"	"	315 " 320 "	" "	"
104	Discolored "	Cocci	Absent	under 60 "	Killed	"
105	Normal "	"	"	" " "	"	"
107	Discolored "	Rods	Present	200 to 205 "	"	"
108	" "	"	"	210 " 215 "	Not Killed	"
109	" "	"	Absent	under 60 "	Killed	"
110	" "	"	Present	270 to 275 "	Not Killed	"
111	" "	"	Absent	under 60 "	Killed	"
112	" "	"	"	" " "	"	"
72	Normal "	Cocci	"	" " "	"	"
C	" "	"	"	" " "	"	"
D	" "	Rods	"	" " "	"	"
X	" "	"	"	" " "	"	"
P	Swelled "	"	Present	200 to 205 "	Not Killed	"
42	" "	"	"	200 " 205 "	" "	"
53	Normal "	"	"	210 " 215 "	" "	"
64	" "	"	"	220 " 225 "	" "	"

N.B. All determinations were made in broth P.H. 6.8, in sternberg bulbs.

Experimental

To contrast the continuous and pressure methods of sterilization, and to arrive at a standard time for sterilization, the following experimental packs were made:

Experimental Pack I, Packed June 3, 1921, Number of cans, 48.

This was a normal pack. Isolated organisms No. 101, 102, 103 and 110 were used. 1 c.c. of a 4 day agar culture emulsified in sterile water was added to each can.

6 cans each marked 101, 102, 103 and 110 respectively were processed at 240°F. for 30 minutes.

6 cans each marked 101a, 102a and 110 a respectivly were boiled at 212°F. for three hours.

The results of the bacteriological examination are shown in Table VII.

TABLE VII.

Date of examination.	Organisms.	Boiled	Processed
June 24 and Aug. 16	101	Unsterile	Sterile
	102	"	"
	103	"	"
	110	"	"

Experimental Pack 11., Packed Sept. 2, 1921

This pack contained similar organism as in pack I. Three series of cans were put up:-

Series I. - This was a normal pack.

" II. - This was a normal pack. The liquor was adjusted by the addition of normal NaOH to PH 7.8.

" III. - Normal, but adjusted with the addition of glacial acetic acid to PH 6.4.

Table VIII shows the bacteriological findings.

Table VIII.

Series.	Date of Examination	Organism.	Boiled	Processed.
I.	Nov. 29, 1921.	101	Unsterile	Sterile
		102	Sterile	"
		103	"	"
		110	Unsterile	"
II.	Nov. 29, 1921.	101	Sterile	"
		102	"	"
		103	Unsterile	"
		110	Sterile	"
III.	Nov. 29, 1921.	101	Sterile	"
		102	Unsterile	"
		103	"	"
		110	"	"

Sterilization in Canned Lobsters.

(1) Continuous Method.

Prescott and Underwood have shown the fallacy of the continuous method of sterilization where resistant spore forming bacteria are present. As shown in the questionnaire, only one percent of the factories employed pressure methods of sterilization. The results in Table VII plainly indicate that where continuous sterilization was practised on spore forming organisms, sterilization was incomplete.

(2) Pressure Method.

From factory experiments and laboratory data, and from a study of resistant forms of bacteria, it is evident that sterilization can only be accomplished by means of the pressure method, with suitable times and temperatures.

Conclusions:-

1. The commercial method of 3 hours is insufficient, as shown by the thermal death points of isolated organisms.
2. Experimental cans inoculated with spore forming bacteria, were not sterile at the end of three hours heating.
3. Similar cans heated for 30 minutes at 240°F. were sterile.
4. Considering the rate of heat penetration and thermal death points of bacteria, 30 minutes at 240°F. for a 4 ounce can has proven sufficient.
5. 7 ounce cans were sterile after 240°F. for 45 minutes

Effect of High Temperature on Lobster Meat.

In order to determine the influence of high temperatures on lobster meat, the following experiments were carried out:-

1. 4 ounce cans, 240°F. for 45 minutes.
2. 4 ounce cans, 250°F. for 25 minutes.

These cans were examined and tasted by expert lobster packers and buyers. The following remarks suffice:

1. Color - meat not keen and bright.
2. Texture - meat "short".
3. Flavour - an overcooked taste.

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First

Inspection Data

Experimental Spring Pack.

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Inspection Data.
First Inspection June 27, 1921.

Lot Number A.

	Lacq. can	Lacq. can
Growth on agar	Absent	Present
PH	7.6	7.6
Discoloration on interior of can	Slight	Very bad
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Poor, soft discolored	Poor, soft discolored
General appearance of pickle	Dark and turbid	Dark and turbid

Lot Number A 1.

Growth on agar	Absent	Absent
pH	6.0	6.0
Discoloration on interior of can	None	None
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Poor consistency, no discoloration.	Poor consistency, no discoloration
General appearance of pickle	Turbid	Turbid

Inspection Data.
First Inspection June 27, 1921

Lot Number B - 5 cans.

	Lacq.can	1dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Present
PH	7.6	7.6	7.6	7.6	7.6
Discoloration on interior of can	Slight	Bad	Bad	Bad	Bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Poor Slight discoloration	Poor Discoloration	Poor Discoloration	Poor Discoloration	Poor Slight Discoloration
General appearance of pickle	Slight brown	Brown	Slight brown	Brown	Brown

Lot Number B 1 - 5 cans.

	Lacq.can	1dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
pH	7.6	7.6	7.6	7.6	7.6
Discoloration on interior of can	Bad	Slight	Bad	Very bad	Very bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Poor Slight discoloration	Poor Slight discoloration	Poor Claw meat discolored	Poor Claw meat Discolored	Poor Slight discoloration
General appearance of pickle	Brown	Brown	Slight brown	Brown	Slight brown

Inspection Data
First Inspection June 27, 1921.

Lot Number C.

	Lacq.Can.	1 dot can	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Present	Absent	Absent	Absent
PH	6.2	6.0	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number C I.

Growth on agar	Absent	Absent	Absent	Absent	Present
PH	6.2	6.0	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data.
First Inspection June 28, 1921.

Lot Number D.

	Lacq. can	1 dot can.	2 dot can.	3 dot can,	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.2	6.0	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discooloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number D I.

Growth on agar	Absent	Absent	Absent	Absent	Present
pH	6.2	6.2	6.0	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data.
First Inspection June 28, 1921

Lot Number E.

	Lacq.Can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Present	Absent	Present	Absent
PH	7.6	7.6	7.5	7.4	7.6
Discoloration on interior of can	Bad	Very bad	Bad	Bad	Bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Poor Slight discoloration	Poor Marked discoloration	Poor Claw meat discolored	Poor Claw meat discolored	Poor Slight discoloration
General appearance of pickle	Slight brown	Brown	Slight brown	Slight brown	Slight brown

Lot Number E 1.

Growth on agar	Absent	Absent	Absent	Absent	Absent
pH	7.6	7.6	7.5	7.6	7.4
Disooloration on interior of can	Very bad	Bad	Very bad	Very bad	Very bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Poor Claw meat discolored	Very poor Slight discoloration	Poor Claw meat discolored	Poor Claw meat discolored	Poor Discolored
General appearnace of pickle	Slight Brown	Slight brown	Very Brown	Slight brown	Slight brown

Inspection Data
First Inspection June 29, 1921.

Lot Number H.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Very slight discoloration	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number H 2.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Present	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	Slight discoloration	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

N.B. Meat slightly brighter in H and H 2 series

Inspection Data
First Inspection June 29, 1921.

Lot Number K.

	Lacq.can	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Present	Absent
pH	7.5	7.4	7.5	7.5	7.5
Discoloration on interior of can	Very bad	Very bad	Bad	Bad	Very bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Poor Slight discoloration	Poor slight discoloration	Poor Slight discoloration	Poor Slight discoloration	Slight discoloration
General appearance of pickle	Brown	Brown	Normal	Normal	Brown

Lot Number K 2

Growth on agar	Absent	Present	Present	Present	Present
pH	7.5	7.5	7.5	7.5	7.5
Discoloration on interior of can	Bad	Bad	Bad	Very bad	Very bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Poor Slight discoloration	Poor Slight discoloration	Poor Slight discoloration	Very Poor Slight discoloration	Poor Slight discoloration
General appearance of pickle	Brown	Slight brown	Brown	Brown	Slight Brown

Inspection Data
First Inspection June 29, 1921.

Lot Number L.

	1 dot can.	2 dot can	3 dot can.	4 dot can.
Growth onagar	Absent	Absent	Absent	Absent
P.H	6.2	6.2	6.4	6.4
Discoloration on interior of can	Trace	Trace	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Lot Number L 2.

Growth on agar	Present	Present	Present	Present
pH	6.2.	6.0	6.2	6.4
Discoloration on interior of can	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
Generalappearance of pickle	Normal	Normal	Normal	Normal

Inspection Data
First Inspection June 29, 1921

Lot Number N.

	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent
P_H	7.4	7.4	7.6	7.4
Discoloration on interior of can	Bad	Bad	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Slight discoloration	Slight discoloration	Normal	Very slight discoloration
General appearance of pickle	Normal	Normal	Normal	Normal

Lot Numb er N 2.

Growth of agar	Present	Present	Absent	Absent
P.H	7.5	7.5	7.4	7.6
Discoloration on interior of can	Bad	Bad	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoleration of can	None	None	None	None
Gene ral appearance of meat	Slight discoloration	Slight discoloration	No discoloration	Slight discoloration
General appearance of pickle	Normal	Normal	Normal	Normal

N.B. In lined cans, meat was brighter and pickle clearer than in unlined.

Inspection Data
First Inspection July 1st, 1921

Lot Number P.

,	Lacq. Can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Present	Absent	Absent	Absent	Absent
PH	7.6	7.4	7.6	7.6	7.6
Discoloration on interior of can	None	Slight	Slight	Slight	Slight
Discoloration of meat from interior dis- coloration	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Turbid	Turbid	Turbid	Turbid

Lot Number P 3.

Growth on agar	Absent	Present	Present	Present	Absent
p^H	7.2	7.4	7.2	7.2	7.4
Discoloration on interior of can	Trace	Trace	Bad	Bad	Bad
Discoloration of meat from interior dis- coloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Marked discoloration	Marked discoloration	Marked dis- color- ation	Marked dis- coloration	Marked discol- oration
General appearance of pickle	Very turbid	Turbid	Turbid	Turbid	Turbid

Inspection Data
First Inspection July 2, 1921

Lot Number J.

	1 dot can.	4 dot can.	4 dot can.
Growth on agar		Absent	Absent
PH		7.4	7.4
Discoloration on interior of can		Slight	None
Discoloration of meat from interior discoloration of can		None	None
Discoloration of pickle from interior discoloration of can		None	None
General appearance of meat		Normal	Normal Shredded
General appearance of pickle		Turbid	Turbid

Lot Number R.

Growth of agar	Absent
PH	7.2
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Discoloration Bluish
General appearance of pickle	Whitish

Inspe ction Data
First Inspection July 2, 1921.

Lot Number J X.

	1 qdt can.
Growth on agar	Absent
P H	7.4
Discoloration on interior of can	Slight
Discoloration of meat from interior dis-coloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Blue Black
General appearance of pickle	Blue

Inspection Data.
First Inspection July 2, 1921.

Lot Number Q.

	1 dot can.	1 dot can.	1 dot can.	1 dot can.
Growth on agar	Absent	Present	Present	Absent
P.H.	7.4	7.4	7.4	7.4
Discoloration on interior of can	Slight	Slight	Trace	Trace
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Poor Discolored	Poor Discolored	Poor Discolored	Poor Discolored
General appearance of pickle	Normal	Normal	Normal	Normal

Lot Number Q4.

Growth on agar	Present	Present	Present	Present
P.H.	7.4	7.4	7.4	7.4
Discoloration on interior of can	Very bad	Slight	Slight	Bad
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Discoloration	Discoloration	Discoloration	Discoloration
General appearance of pickle	Normal	Normal	Normal	Normal

Inspection Data
First Inspection July 2, 1921.

Lot Number Y.

	Lacq.can	Lacq. can	Lacq.can.
Growth on agar	Absent	Absent	Absent
pH	7.4	7.4	7.6
Discoloration on interior of can	Bad	Bad	Bad
Discoloration of meat from interior discoloration of can	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None
General appearance of meat	Marked discoloration	Marked discoloration	Marked discoloration -Prussian blue
General appearance of pickle	Turbid	Turbid	Turbid

Lot Number Y2.

Growth on agar	Absent	Absent	Absent
p.H	6.2	6.2	6.2
Discoloration on interior of can	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None
General appearance of meat	Normal color	Normal Color	Normal color - Poor consistency hard and dry.
General appearance of pickle	Redder than normal	Redder than normal	Redder than normal

Inspection Data
First Inspection July 2, 1921.

Lot Number S 5.

	Lacq. can	1 dot can.	2 dot can	3 dot can.	4 dot can.
Growth on agar	Present	Absent	Absent	Absent	Absent
pH.	7.4	7.4	7.4	7.4	7.6
Discoloration on interior of can	Slight	None	None	Trace	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Discoloration	Slight discoloration	Discoloration	Slight discoloration
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number S

Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.6	7.4	7.6	7.6	7.6
Discoloration on interior of can	Slight	Slight	Slight	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Marked discoloration	Marked discoloration	Marked discoloration	Marked discoloration	Marked discoloration
General appearance of pickle	Brown	Brown	Brown	Brown	Brown

Inspection Data.
Fizst Inspection July 2, 1921.

Lot Number S.L.T.

	Salt Percentages						
	2	4	6	8	10	12	14
Growth on agar	Absent	Absent	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	Slight	Slight	Slight	Slight	Slight	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal	Normal	Normal

Lot Number J.X.S.

	4 dot can.	4 dot can.
Growth on agar	Present	Absent
p H	7.6	7.6
Discoloration on interior of can	Bad	Bad
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Discoloration	Discoloration
General appearance of pickle	Normal	Normal

Inspection Data
First Inspection July 4, 1921

Lot Number A 8.

	Lacq. can	Lacq. can
Growth on agar	Absent	Absent
PH	7.6	7.6
Discoloration on interior of can	Bad	Slight
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Normal	Slight discoloration
General appearance of pickle	Normal	Normal

Lot Number S.E.A.

Growth on agar	Absent	Absent
PH	7.6	7.6
Discoloration on interior of can	Slight	Bad
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearan ce of meat	Slight discoloration	Normal
Gene ral appearance of pirkle	Normal	Normal

Inspection Data.
First Inspection July 4, 1921.

Lot Number G.S.T.

	Lacq. Can	Lacq. can
Growth on agar	Absent	Absent
P H	7.6	7.6
Discoloration on interior of can	Slight	Bad
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Normal	Normal
General appearance of pickle	Normal	Normal

Lot Number T.I.N.

Growth on agar	Absent	Absent	
P.H	7.6	7.6	
Discoloration on interior of can	Slight	Trace	
Discoloration of meat from interior discoloration of can	None	None	
Discoloration of pickle from interior discoloration of can	None	None	
General appearance of meat	Slight discoloration	Slight discoloration	Tin discolored meat - Metal pieces show typical discoloration
General appearance of pickle	Normal	Normal	

Inspection Data.
First Inspection July 4, 1921.

Lot Number W.V.

	Lacq. can.	Lacq. Can.
Growth on agar	Absent	Absent
PH	7.6	7.4
Discoloration on interior of can	Slight	Slight
Discoloration of meat from interior dis-coloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Normal	Normal
General appearance of pickle	Normal	Normal

Inspection Data.
First Inspection July 4, 19 21.

Lot Number J.Y.

	Lacq. can	Lacq. can
Growth on agar	Absent	Absent
PH	7.4	7.6
Discoloration on interior of can	Bad	Slight
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of c an	None	None
General appearance of meat	Slight discoloration	Slight discoloration
Gene ral appearance of pickle	Normal	Normal

Lot Number F.O.

Growth on agar	Absent	Absent
PH	7.4	7.4
Discoloration on interior of can	None	None
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Slight discoloration	Slight discoloration - Meat poor.
General appearance of pickle	Brown	Brown

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Second

Inspection Data

Experimental Spring Pack.

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Inspection Data.
Second Inspection August 16, 1921.

Lot Number A.

	Lacq. can
Growth on agar	Absent
P.H	7.6
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can.	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Poor consistency. Black
General appearance of pickle	Normal.

Lot Number A 1.

Growth on agar	Absent
P.H	6.0
Discoloration on interior of can	None
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Poor consistency Small pieces
General appearance of pickle	Normal

Inspection Data.
Second Inspection August 16, 1921.

Lot Number B.

	Lacq. Can.	1 dot can.	2 dot can.	3 dot can	4 dot can
Growth on agar					
P H	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	Bad	Slight	Bad	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Slight discoloration	Very slight discoloration	Marked discoloration	Normal	Slight discoloration
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number B 1.

Growth on agar					
P.H.	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	Very bad	Bad	Bad	Bad	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Slight discoloration	Slight discoloration	Slight discoloration	Slight discoloration	Very slight discoloration
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data
Second Inspection August 16, 1921.

Lot Number C.

	Lacq.can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar					
pH	6.2	6.2	6.0	6.2	6.2
Discoloration on interior of can	Bad	None	Trace	None	None
Discoloration of meat from interior discoloration	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Slight discoloration	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number C1.

Growth on agar					
pH	6.0	6.2	6.2	6.2	6.2
Discoloration on interior of can	Bad	Very slight	Slight	Very Slight	Very Slight
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data.
Second Inspection August 16, 1921.

Lot Number D.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can
Growth on agar					
PH	6.2	6.0	6.0	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number D 1.

Growth on agar					
PH	6.2	6.0	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Nommal	Normal	Normal

Inspection Data
Second Inspection August 16, 1921.

Lot Number E.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
pH	7.4	7.4	7.4	7.4	7.5
Discoloration on interior of can	Slight	Very bad	Very bad	Slight	Bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	Discoloration	None	None
General appearance of meat	Slight discoloration	Marked discoloration	Marked discoloration	Slight Discoloration	Slight Discoloration
General appearance of pickle	Normal	Normal	Discoloration	Normal	Normal

Lot Number E.I.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	Very bad	Very bad	Very bad	Very bad	Bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Slight discoloration	Marked discoloration	Marked discoloration	Marked discoloration	Discoloration
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data
Second Inspection August 16, 1921.

Lot Number H.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	Slight	Slight	None	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number H 2.

Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	Bad	Slight	Bad	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data.
Second Inspection August 16th, 1921.

Lot Number K.

	Lacq. Can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4	7.2
Discoloration on interior of can	Bad	Bad	Very bad	Bad	Bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	Bad	None	None
General appearance of meat	Slight Discoloration	Slight discoloration	Slight discoloration	Slight discoloration	Slight discoloration
General appearance of pickle	Slight black	Turbid	Black	Slight	Slight

Lot Number K 2.

Growth on agar	Present	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	Very bad	Bad	Very bad	Bad	Bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	Bad	None	None	None	None
General appearance of meat	Slight discoloration	Slight discoloration	Marked discoloration	Slight discoloration	Slight discoloration
General appearance of pickle	Black	Turbid	Black	Slight black	Normal

Inspection Data.
Second Inspection August 16, 1921.

Lot Number L.

Lacq. can. 1 dot can. 2 dot can. 3 dot can. 4 dot can.

Growth on agar	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Lot Number L.2.

Growth on agar	Absent	Absent	Absent	Absent
PH	6.2	6.0	6.2	6.2
Discoloration on interior of can	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Inspection Data.
Second Inspection August 16, 1921.

Lot Number N.

	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4
Discoloration on interior of can	Bad	Slight	Slight	Bad Paper discoloration
Discoloration of meat from interior discoloration of can	Bad	None	None	None
Discoloration of pockle from interior discoloration of can	None	None	None	None
General appearance of meat	Bad	Slight discoloration	Slight discoloration	Slight discoloration
General appearance of pickle	Bad	Normal	Normal	Normal

Lot Number N 2.

Growth on agar	Present	Present	Absent	Absent
PH	7.4	7.4	7.4	7.4
Discoloration of interior of can	Slight	Bad -paper stained	Slight stained	Slight stained
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

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Lot Number P.

	Lacq.can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	None	Slight	Slight	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number P 3.

Growth on agar	Absent	Present	Absent	Absent	Absent
PH	7.2	7.4	7.2	7.2	7.4
Discoloration on interior of can	Slight	Bad	Slight	Bad	Bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Marked Discoloration	Marked Discoloration	Marked Discoloration	Marked Discoloration	Marked Discoloration
General appearance of pickle	Turbid	Turbid	Turbid	Turbid	Turbid

Inspection Data.
Second Inspection August 16, 1921.

Lot Number J.

	4 dot can.
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Slight
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Poor Disintegrated
General appearance of pickle	Normal

Lot Number R.

Growth on agar	Absent
PH	7.2
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Bluish discoloration
General appearance of pickle	Bluish

Inspection Data.
Second Inspection August 16, 1921.

Lot Number J.K.

1 dot can.	
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Slight
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Blue Black
General appearance of pickle	Blue

Inspection Data.
Second Inspection August 16, 1921.

Lot Number Q.

	Lacq. can.	1 dot can.
Growth on agar	Absent	Absent
PH	7.4	7.4
Discoloration on interior of can	Bad	Bad
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Bad Discoloration	Discoloration
General appearance of pickle	Normal	Normal

Lot Number Q.4.

Growth on agar	Absent	Absent
PH	7.4	7.4
Discoloration on interior of can	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Slight Discoloration	Slight Discoloration
General appearance of pickle	Normal	Normal

Inspection Data.
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Lot Number Y.

	Lacq. can.
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Slight
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Dirty Poor consistency
General appearance of pickle	Turbid

Lot Number Y 2.

Growth on agar	Absent
PH	6.2
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Poor consistency
General appearance of pickle	Turbid

Inspection Data.
Second Inspection Aug. 17, 19 21.

Lot Number S 5.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.2	7.2
Discoloration on interior of can	None	Slight	Slight	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Black	Slight discoloration	Normal	Very Slight
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number S

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	Bad	Bad	Bad	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Marked discoloration	Marked discoloration	Marked discoloration	Marked discoloration	Marked discoloration
General appearance of pickle	Slight discoloration Turbid	Slight discoloration Turbid	Normal	Normal	Marked discoloration

Inspection Data.
Second Inspection August 16, 1921.

Lot Number S.L.T.

	Salt Percentages						
	2	4	6	8	10	12	14
Growth on agar	Absent	Absent	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	Slight	Slight	Slight	Slight	Slight	Slight	Bad
Discoloration of meat from interior discoloraton of can	None	None	None	None	None	None	None
Discoloratiom of pickle from interior discoloration of can	None	None	None	None	None	None	None
Gene ral appearance of meat	Normal	Normal	Normal	Normal	Normal	Normal	Normal
Gen eral appearance of pickle	Normal	Normal	Normal	Normal	Normal	Normal	Normal

Lot Number J.X.S.

Growth on agar	Absent
PH	7.6
Discoloration on interior of can	Bad
Discoloration of meat from interior dis-coloration of can	None
Discoloration of pickle f rom interior discoloration of can	None
General appearance of meat	Slight Discoloration
General appearance of pickle	Normal

Inspection Data.
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Lot Number A8.

Lacq. can.	
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Slight discoloration
General appearance of pickle	Normal

Lot Number S.E.A.

Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Very bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration od can	None
General appearance of meat	Slight discoloration
General appearance of pickle	Normal

Inspection Data.
Second Inspection August 17, 1921.

Lot Number O.S.T.

	Lacq. Can.
Growth on agar	Absent
PH	7.6
Discoloration on interior of can	Very bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Slight
General appearance of pickle	Slight

Lot Number T.I.N.

Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Slight - Tin discolored
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Very Slight
General appearance of pickle	Slight

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Second Inspection August 17, 1921.

Lot Number W.V.

	Lacq. can.
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Slight discoloration - Tin discolored
General appearance of pickle	Normal

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Lot Number J.Y.

	Lacq. Can.
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration	None
Discolorstion of pickle from interior discoloration of can	None
General appearance of meat	Slight
Gene ral appearance of pickle	Normal

Lot Number F.O.

Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Grey discoloration
General appearance of pickle	Turbid

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Third

Inspection Data

Experimental Spring Pack.

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Lot Number A.

	Lacq. Can.	Lacq. Can.
Growth on agar	Absent	
PH	7.4	
Discoloration on interior of can	Slight	
Discoloration of meat from interior discoloration of can	None	
Discoloration of pickle from interior discoloration of can	None	
General appearance of meat	Poor Slight discoloration	
General appearance of pickle	Turbid	

Lot Number A 1.

Growth on agar	Absent	Absent
PH	6.0	6.0
Discoloration on interior of can	Slight	Very Slight
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Poor slight discoloration	Poor slight discoloration
General appearance of pickle	Turbid	Turbid

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Lot Number B.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.6	7.6	7.6	7.6	7.6
Discoloration on interior of can	Bad	Bad	Bad	Bad	Slight
Discoloration of meat from interior discoloration of can	Slight discoloration	Slight discoloration	Slight discoloration	Slight discoloration	Slight Discoloration
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Dead	Slight discoloration	Marked discoloration	Marked discoloration	Slight discoloration
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number BI.

Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.6	7.6	7.6
Discoloration on interior of can	Bad	Bad	Bad	Bad	Slight
Discoloration of meat from interior discoloration of can	Slight discoloration	Slight discoloration	Slight discoloration	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Not bright	Discoloration	Not bright	Discoloration	Not bright
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

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Lot Number C.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.4	6.4	6.4	6.4	6.4
Discoloration on interior of can	Bad	Trace	Slight	Slight	Trace
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number CI.

Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.4	6.4	6.4	6.4	6.4
Discoloration on interior of can	Bad	Trace	Trace	None	Trace
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

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Lot Number D.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.4	6.4	6.4	6.4	6.4
Discoloration on interior of can	None	None	Bad	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	Bone
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot number DI.

Growth on agar	Absent	Present	Absent	Absent	Absent
PH	6.4	Leak	6.4	6.4	6.4
Discoloration on interior of can	None		None	None	None
Discoloration of meat from interior discoloration of can	None		None	None	None
Discoloration of pickle from interior discoloration of can	None		None	None	None
General appearance of meat	Normal		Normal	Normal	Normal
General appearance of pickle	Normal		Normal	Normal	Normal

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Lot Number E.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.6	7.6	7.6	7.6	7.6
Discoloration on interior of can	Bad	Very bad	Very bad	Bad	Bad
Discoloration of meat from interior discoloration of can	Slight discoloration	Discoloration	Discoloration	Discoloration	Discoloration
Discoloration of pickle from interior discoloration of can	None	Slight discoloration	Slight	Slight	Slight
General appearance of meat	Slight discoloration	Discoloration	Discoloration	Discoloration	Discoloration
General appearance of pickle	Normal	Discoloration	Turbid	Slight Discoloration	Normal

Lot Number E 1.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Present	Absent	Absent	Absent
PH	7.6	Leak	7.6	7.6	7.6
Discoloration on interior of can	Very bad	Very bad	Very bad	Very bad	Bad
Discoloration of meat from interior discoloration of can	Discoloration	Discoloration	Discoloration	Discoloration	None
Discoloration of pickle from interior discoloration of can	Slight	Slight	Slight	Slight	Slight
General appearance of meat	Marked Discoloration	Discoloration Marked	Discoloration Marked	Discoloration	Slight Discoloration
General appearance of pickle	Slight discoloration	Slight discoloration	Slight discoloration	Slight discoloration	Normal

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Lot Number H.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.4	6.4	6.4	6.4	6.4
Discoloration on interior of can	Trace	Slight	Slight	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Slight	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number H 2.

Growth on agar	Absent	Present	Absent	Present	Absent
PH	6.2	6.4	6.4	6.4	6.4
Discoloration on interior of can	Slight	Slight	Trace	Slight	Trace
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

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Lot Number K.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.6	7.6	7.6	7.6	7.6
Discoloration on interior of can	Very bad	Very bad	Very bad	Very bad	Bad
Discoloration of meat from interior discoloration of can	Discoloration	Discoloration	Discoloration	Discoloration	Discoloration
Discoloration of pickle from interior discoloration of can	Discoloration	Discoloration	Discoloration	Discoloration	Slight Discoloration
General appearance of meat	Marked Discoloration	Marked Discoloration	Marked Discoloration	Marked Discoloration	Marked Discoloration
General appearance of pickle	Discoloration	Discoloration	Discoloration	Discoloration	Slight Discoloration

Lot Number K 2.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Present	Absent	Absent
PH.	7.6	7.6	7.6	7.6	7.6
Discoloration on interior of can	Very bad	Very bad	Very bad	Very bad	Very bad
Discoloration of meat from interior discoloration of can	Marked discoloration	Discoloration	Discoloration	Discoloration	Discoloration
Discoloration of pickle from interior discoloration of can	Discoloration	Discoloration	Discoloration	Discoloration	Discoloration
General appearance of meat	Marked discoloration	Marked discoloration	Marked discoloration	Slight discoloration	Slight discoloration
General appearance of pickle	Discoloration	Discoloration	Discoloration	Discoloration Slight	Discoloration Slight

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Lot Number L.

	1 dot can.	2 dot can.	3 dot can.	4 dot can
Growth on agar	Absent	Absent	Absent	Absent
PH	6.4	6.4	6.4	6.4
Discoloration on interior of can	Trace	Slight	Slight	Trace
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Lot Number L 2.

Growth on agar		Absent	Absent	Absent
PH	Leak	6.4	6.4	6.4
Discoloration on interior of can		Trace	Trace	Trace
Discoloration of meat from interior discoloration of can		None	None	None
Discoloration of pickle from interior discoloration of can		None	None	None
General appearance of meat		Normal	Normal	Normal
General appearance of pickle		Normal	Normal	Normal

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Lot Number N.

	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4
Discoloration on interior of can	Bad	Slight	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle f rom interior discoloration of can	None	None	Slight	None
General appearance of meat	Normal	Slight Discoloration	Normal	Slight Discoloration
General appearance of pickle	Normal	Normal	Slight Discoloration	Normal

Lot Number N 2.

Growth on agar	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4
Discoloration on interior of can	Bad	Slight	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Slight Discoloration	Normal	Slight Discoloration	Slight Discoloration
General appearance of pickle	Normal	Normal	Normal	Normal

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Lot Number P.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	Trace	Trace	Slight	Very bad	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Slight discoloration	Normal	Slight discoloration	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number P3

Growth on agar	Absent	Absent
PH	7.4	8.4
Discoloration on interior of can	Bad	Bad
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Slight discoloration	Slight discoloration
General appearance of pickle	Slight discoloration	Slight discoloration

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Lot Number J.

	Lacq. can.
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Slight
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Marked discoloration
General appearance of pickle	Normal

Lot Number R.

Growth on agar	Absent
PH	6.4
Discoloration on interior of can	Very bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Marked discoloration Blue black
General appearance of pickle	Slight discoloration

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Lot Number JX.

	Lacq. can.
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Marked discoloration - Blue black
General appearance of pickle	Normal

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Lot Number Q4.

	Lacq. can.	Lacq. can.
Growth on agar	Absent	Absent
PH	7.4	7.4
Discoloration on interior of can	Bad	Badm
Discoloration of meat from interior discoloration of can.	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Marked discoloration	Marked discoloration
General appearance of pickle	Normal	Normal

Lot Number Q.

	Lacq. can.	Lacq. can.
Growth on agar	Absent	Present
PH	7.4	7.4
Discoloration on interior of can	Bad	Bad
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Marked discoloration	Marked discoloration
General appearance of pickle	Normal	Normal

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Lot Number Y.

	Lacq. can.
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Bad
General appearance of pickle	Turbid

Lot Number Y2.

Growth on agar	Absent
PH	6.4.
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Marked discoloration
General appearance of pickle	Normal

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Lot Number S5.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	Slight	Bad	Very bad	Bad	Bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Slight discoloration	Slight discoloration	Marked discoloration	Slight discoloration	Slight discoloration
General appearance of pickle	Normal	Normal	Slight discoloration	Marked discoloration	Marked Discoloration

Lot Number S.

Growth on agar	Absent	Absent
PH	7.4.	7.4
Discoloration on interior of can	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Slight discoloration	Slight discoloration
General appearance of pickle	Normal	Normal

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Lot Number S.L.T.

	Salt Percentages						
	2	4	6	8	10	12	14
Growth on agar	Absent	Absent	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	Slight	Bad	Bad	Bad	Very bad	Very bad	Very Bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None	None	None
General appearance of meat	Slight discol-oration	Slight discol-oration	Slight discol-oration	Slight discol-oration	Slight discol-oration	Slight discol-oration	Slight discol-oration
General appearance of pickle	Normal	Normal	Normal	Normal	Normal	Normal	Normal

Lot Number J X S.

Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of Meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Marked dis-coloration
General appearance of pickle	Normal

Inspection Data.
Third Inspection Nov. 15, 1921.

Lot Number A8

Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Slight discoloration
General appearance of pickle	Normal

Lot Number S.E.A.

Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Very bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Slight discoloration
General appearance of pickle	Normal

Inspection Data.
Third inspection Nov. 15, 1921.

Lot Number G.S.T.

Lacq. can.	
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Very bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Marked discoloration - Gasket discolored.
General appearance of pickle	Slight discoloration

Lot Number T.I.N.

Growth on agar	Absent
PH	7.6
Discoloration on interior of can	Slight
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of pickle	Slight discoloration - Tin black
General appearance of pickle	Normal

Inspection Data.
Third Inspection Nov. 15, 1921.

Lot Number W.V.

	Lacq. can.
Growth on agar	Absent
PH	7.6
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	Slight discoloration
Discoloration of pickle from interior discoloration of can	None - Tin discolored
General appearance of meat	Slight discoloration
General appearance of pickle	Normal

Inspection Data.
Third Inspection Nov. 15, 1921.

Lot Number J.Y.

	Lacq. can.
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Slight discoloration.
General appearance of pickle	Normal

Lot Number F.O.

Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	Slight discoloration
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Marked discoloration
General appearance of pickle	Normal

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Fourth

Inspection Data

Experimental Spring Pack.

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Inspection Data.
Fourth Inspection, February 15, 1921.

Lot Number A.

	Lacq. can.
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Slight
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Dead Slight discoloration
General appearance of pickle	Turbid

Lot Number A1.

Growth on agar	Absent
PH	6.4
Discoloration on interior of can	Slight
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Dead Slight discoloration
General appearance of pickle	Turbid

Inspection Data.
Fourth Inspection Feb. 16, 1921.

Lot Number B.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.6	7.6	7.6	7.6	7.6
Discoloration on interior of can	Bad	Bad	Bad	Bad	Bad
Discoloration of meat from interior discoloration of can	Slight	Slight	Slight	Slight	Slight
Discoloration of pickle from interior discocloration of can	None	None	Slight	None	None
General appearance of meat	Slight Dead	Marked discoloration	Marked discoloration	Dead	Slight discoloration
General appearance of pickle	Normal	Normal	Marked discoloration	Normal	Normal

Lot Number B1

Growth on agar	Absent	Present	Present	Present	Present
PH	7.6	7.6	7.6	7.6	7.4
Discoloration on interior of can	Very bad	Bad	Bad	Bad	Bad
Discoloration of meat from interior discoloration of can	None	Slight	None	None	Slight
Discoloration of pickle from interior discoloration of can	None	Slight	Slight	Slight	None
General appearance of meat	Slight discoloration	Marked discoloration	Slight discoloration	Slight discoloration	Slight discoloration
General appearance of pickle	Normal	Slight discolcration	Slight discoloration	Slight discoloration	Normal

Inspection Data.
Fourth Inspection Feb. 16, 1921.

Lot Number C.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.4	6.4	6.4	6.4	6.4
Discoloration on interior of can	Trace	Trace	None	None	Trace
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number Cl.

Growth on agar	Absent	Present	Present	Absent	Absent
PH	6.4	6.4	6.4	6.4	6.4
Discoloration on interior of can	Slight	Bad	Bad	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Slight discoloration	Slight discoloration	Normal	Normal
General appearance of pickle	Normal	Normal	Norm al	Normal	Normal

Inspection Data.
Fourth Inspection Feb. 16, 1922.

Lot Number D.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.4	6.4	6.4	6.4	6.4
Discoloration on interior of can	None	None	None	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Slight discoloration	Normal	Normal	Normal
General appearance of pickle	Normal	Turbid	Normal	Normal	Normal

Lot Number D1.

Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.4	6.4	6.4	6.4	6.4
Discoloration on interior of can	Trace	Trace	None	Trace	Trace
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data
Fourth Inspection Feb. 16, 1922.

Lot Number E.

	Lacq. Can.	1 dot can.	2 dot can	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Present	Absent	Absent
PH	7.6	7.6	7.6	7.6	7.6
Discoloration on interior of can	Very bad	Very bad	Very bad	Bad	Very Bad
Discoloration of Meat from interior discoloration of can	Bad	Bad	Bad	Bad	Bad
Discoloration of pickle from interior discoloration of can	None	None	None	None	Slight
General appearance of meat	Marked discoloration	Marked discoloration	Marked discoloration	Marked discoloration	Marked discoloration
General appearance of pickle	Normal	Normal	Turbid	Normal	Slight discoloration

Lot Number E1.

	Lacq. Can.	1 dot can.	2 dot can	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.6	7.6	7.6	7.6	7.6
Discoloration on interior of can	Very bad	Very bad	Bad	Bad	Bad
Discoloration of meat from interior discoloration of can	Bad	Bad	Bad	Bad	Bad
Discoloration of pickle from interior discoloration of can	Slight	Slight	Slight	Slight	Slight
General appearance of meat	Marked discoloration	Marked discoloration	Marked discoloration	Slight discoloration	Marked discoloration
General appearance of pickle	Slight discoloration	Slight discoloration	Slight discoloration	Slight discoloration	Slight discoloration

Inspection Data.
Fourth Inspection Feb. 16, 1922

Lot Number H.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Present	Absent	Absent	Absent
PH	6.4	6.4	6.4	6.4	6.4
Discoloration on interior of can	Slight	Slight	None	Trace	Trace
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration	None	None	None	None	None
General appearance of meat	Normal	Slight discoloration	Normal	Normal	Normal
General appearance of pickle	Normal	Turbid	Normal	Normal	Normal

Lot Number H 2.

Growth on agar	Absent	Present	Present	Absent	Absent
PH.	6.2	6.4	6.4	6.4	6.4
Discoloration on interior of can	None	Slight	Slight	Trace	None
Discoloration of meat from interior discoloration of can	None	Bad	Bad	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Marked discoloration	Marked discoloration	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data.
Fourth Inspection, February 16, 1922.

Lot Number K.

	Lacq. Can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH.	7.6	7.6	7.6	7.6	7.6
Discoloration on interior of can	Very bad	Very bad	Very bad	Very bad	Very bad
Discoloration of meat from interior discoloration of can	Slight	Slight	Slight	Slight	Slight
Discoloration of pickle from interior discoloration of can	Slight	Slight	Slight	Slight	Slight
General appearance of meat	Slight discoloration	Marked discoloration	Slight discoloration	Slight discoloration	Slight discoloration
General appearance of pickle	Slight discoloration	Slight discoloration	Slight discoloration	Slight discoloration	Slight discoloration

Lot Number K 2.

Growth on agar	Absent	Absent	Absent	Absent	Absent
PH.	7.6	7.6	7.6	7.6	7.6
Discoloration on interior of can	Very bad	Very bad	Very bad	Very bad	Very bad
Discoloration of meat from interior discoloration of can	Slight	Slight	Slight	Slight	Slight
Discoloration of pickle from interior discoloration of can	None	None	None	None	Slight
General appearance of meat	Slight discoloration	Slight discoloration	Slight discoloration	Slight discoloration	Slight discoloration
General appearance of pickle	Slight discoloration	Normal	Slight discoloration	Slight discoloration	Slight discoloration

Inspection Data.
Fourth Inspection, Feb. 16, 1922.

Lot Number L.

	1 dot can.	2 dot can.	3 dot can.	4 dot can
Growth on agar	Absent	Absent	Absent	Absent
PH	6.4	6.4	6.4	6.4
Discoloration on interior of can	Trace	Trace	Trace	Trace
Dsicoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Parchment linings clean.

Lot Number L2.

Growth on agar	Absent	Absent	Absent	Absent
PH	6.4	6.4	6.4	6.4
Discoloration on interior of can	Slight	Trace	None	Trace
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Parchment linings clean

Inspection Data.
Fourth Inspection Feb. 16, 19 22.

Lot Number N.

	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4
Discoloration on interior of can	Very bad	Bad	Slight	Bad
Discoloration of meat from interior discoloration of can	Slight	Slight	Slight	Bad
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Slight	Normal	Slight
General appearance of pickle	Normal	Normal	Normal	Normal

Parchment linings badly discolored.

Lot Number N 2.

Growth on agar	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4
Discoloration on interior of can	Very Bad	Bad	Slight	Slight
Discoloration of meat from interior discoloration of can	Bad	Slight	Slight	Bad
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Slight Dead	Slight Dead	Slight Dead	Dead
General appearance of pickle	Normal	Normal	Normal	Normal

Parchment linings badly discolored.

Inspection Data
Fourth Inspection, Feb. 16, 1922.

Lot Number J.

	Lacq. can.
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Trace
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	Slight
General appearance of meat	Dead Marked discoloration
General appearance of pickle	Slight discoloration

Lot Number R.

Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	Bad
Discoloration of pickle from interior discoloration of can	Slight
General appearance of meat	Blue Black
General appearance of pickle	Marked discoloration

Inspection Data.
Fourth Inspection, Feb. 16, 1922.

Lot Number J X.

	Lacq. can.
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	Bad
Discoloration of pickle from interior discoloration of can	Bad
General appearance of meat	Black Blue
General appearance of pickle	Slight discoloration

Inspection Data.
Fourth Inspection, Feb. 16, 1921.

Lot Number Q.

	Lacq. can.
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Trace
Discoloration of meat from interior discoloration of can	Slight
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Dead
General appearan ce of pickle	Normal

	Lot Number Q4.
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	Bad
Discoloration of pickle from interior discoloration of can	Slight
General appearance of meat	Dead
General appearance of pickle	Turbid

Inspection Data
Fourth Inspection, Feb. 16, 1921.

Lot Number Y.

	Lacq. can.
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can.	None
General appearance of meat	Dead Slight discoloration
General appearance of pickle	Slight discoloration

Lot Number Y 2.

Growth on agar	Absent
PH	6.4
Discoloration on interior of can	None
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Dead
General appearance of pickle	Slight discoloration

Inspection Data.
Fourth Inspection, Feb. 16, 1922

Lot Number S 5.

	Lacq. can.
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	Bad
Discoloration of pickle from interior discoloration of can.	None
General appearance of meat	Dead Marked discoloration
General appearance of pickle	Yellowish Turbid

Lot Number S

Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	Bad
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Marked discoloration
General appearance of pickle	Slight discoloration

Inspection Data
Fourth Inspection, February 16, 1922.

Lot Number J X S.

	Lacq. can.
Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	Slight
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Marked discoloration
General appearance of pickle	Normal

SUMMARY OF SPRING EXPERIMENTAL DATA.

I. In the experimental spring pack, the degree of can discoloration was as great in the heaviest quality of tin plate as in the lightest grades.

2. The quality of the tin plate is a minor factor in can discoloration.

3. Discoloration of the can interior can only be prevented by other means.

4. An average of the four inspections, with an adjusted PH from alkaline to acid, prevents discoloration of the meat in 96 percent of the cans, with 4 percent showing slight discoloration.

5. An average of the four inspections with normal spring pack lobsters, with a PH adjusted to 7.4 shows meat discoloration as follows :- No discoloration 9 percent, slight discoloration 64 percent, marked discoloration 25 percent.

6. An average of the four inspections with adjusted PH from 7.6 to 6.2 prevents discoloration of the can interior in 50 percent of the cans, 22 percent show only a trace, I9 percent slight, 9 percent bad, while no cans classed as very bad are present.

7. An average of the four inspections with a normal PH 7.6 shows discoloration of the can interior as follows:- No discoloration 4 percent, trace 6 percent, slight 28 percent, bad 37 percent, very bad 25 percent.

8. The use of acetic acid in adjusting the PH has proven highly satisfactory after nine months storage, both as a preventive for meat and can discoloration.

9. After nine months storage, normal pack lobster with PH 7.6 and adjusted pack lobsters PH 6.2, show chemical discoloration of the tin interior as follows:- Normal,- No discoloration 0 percent, slight discoloration 15 percent, bad 40 percent, very bad 45 percent. Adjusted,- No discoloration 25 percent, trace 40 percent, slight 31 percent, bad 4 percent, very bad 0 percent.

10. After nine months storage three normal and three adjusted spring packs show the following:-

Pack	PH	Quantity of pickle.	Linings.	Quality of meat.
B and B1	7.6	Normal	Absent	Second
E and E2	7.6	$1\frac{1}{2}$ times	Absent	Unmarketable
N and N2	7.6	Normal	Present	Second
C and C1	6.2	Normal	Absent	First
D and D1	6.2	$1\frac{1}{2}$ times	Absent	First
L and L2	6.2	Normal	x Present	First

x Where linings were used the meat was slightly brighter in appearance.

11. Discoloration is present where no pickle is added.

12. Delay in packing lobsters is a common cause of discoloration.

13. Canning dead lobsters produce typical discoloration.

14. Where lobster blood is not carefully washed from the meat, blue black discoloration is present.

15. Where cans are exhausted by preheating, discoloration is not produced.

16. Where cans are exhausted by preheating in the presence of linings and the reaction adjusted to PH 6.2, lobster meat and cans are free of discoloration in 95 percent of the pack.

17. Pyridine has been isolated from canned lobsters and in an alkaline medium has a corrosive action on tin plate.

18. Discoloration is as noticeable with fresh as with sea water pickle.

19. Discoloration is as common in high percentages of salt as in low.

20. Tight seams are necessary for lobster cans to avoid air and rust discoloration which accelerates the formation of the black sulphite.

21. Discoloration is encouraged in an alkaline medium, and pyridine has a corrosive action on the tin plate.

22. The use of parchment paper is recommended.

23. From heat penetration studies, the continuous method of sterilization at 212^{o}F. is not recommended. 240^{o}F. for 30 minutes for a 4 ounce can, and 45 minutes for a 7 ounce can should be adopted.

24. Temperatures of sterilization above 240 F. affect the quality of the meat.

25. Discoloration is favored by the use of arm and leg meat.

26. Spore forming bacteria associated with lobsters are killed only on long boiling, or at pressure temperatures.

27. Hydrogen sulphide is not of prime importance in the production of chemical discoloration, but is influenced by the hydrogen ion concentration.

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First

Inspection Data

Experimental Fall Pack.

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Inspection Data.
First Inspection - Fall Pack, Sept. 29, 1921.

Lot Number B.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.6	6.6	6.6	6.6	6.6
Discoloration on interior of can	Bad	None	Rusty Slight	Rusty Slight	None
Discoloration of meat from interior discoloration of can	None	None	Nome	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Slight discoloration	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number B 1.

Growth on agar	Absent	Absent	Absent	Present	Absent
PH	6.8	6.6	6.6	6.6	6.6
Discoloration on interior of can	None	Slight	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Dead	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data.
First Inspection - Fall Pack, Sept. 29, 1921.

Lot Number C.

	Lacq. Can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number C I.

Growth on agar	Absent	Absent	Present	Present	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data.
First Inspection - Fall Pack, Sept. 29. 1921.

Lot Number D.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH.	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number D 2.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can
Growth on agar	Absent	Present	Present	Absent	Absent
PH .	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data.
First Inspection - Fall Pack, Sept. 29, 1921.

Lot Number E.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot ca
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.2	7.2	7.2	7.2	7.2
Discoloration on interior of can	Very Bad	Bad	Bad	Bad	Bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Marked discoloration	Slight discoloration	Slight discoloration	Slight discoloration	Slight discoloration
General appearance of pickle	Brown	Brown	Brown	Brown	Brown

Lot Number E 2.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot ca
Growth on agar	Present	Present	Present	Absent	Absent
PH	7.2		7.2	7.4	7.2
Discoloration on interior of can	Bad	Bad	Slight	Bad	Slight
Discoloration of meat from interior discoloration of can	None		None	None	None
Discoloration of pickle from interior discoloration of can	None		None	None	None
General appearance of meat	Slight discoloration		Marked discoloration	Dead	Slight discoloration
General appearance of pickle	Brown		Clear	Brown	Normal

Inspection Data.
First Inspection - Fall Pack, Sept. 29, 1921.

Lot Number N.

	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Present	Absent	Absent	Absent
PH	6.6	6.6	6.6	6.6
Discoloration on interior of can	Rusty brown	Slight Some rust	Rusty brown	Slight rust
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Lot Number N 2.

Growth on agar	Present	Absent	Absent	Absent
PH	6.6	6.6	6.6	6.6
Discoloration on interior of can	Slight	Bad	Slight rust	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Inspection Data.
First Insppection - Fall Pack, Sept. 29, 1921.

Lot Number L.

	1 dot can.	2 dot can.	3 dot can.	4 dot can
Growth on agar	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Lot Number L 2.

Growth on agar	Present	Present	Absent	Absent
PH	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Inspection Data
First Inspection - Fall Pack, Sept. 29, 1921.

Lot Number X.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	Bad	Very Bad	Trace	Bad	Bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Dead	Slight discol-oration	Normal	Slight discol-oration	Dead
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number X 1.

Growth on agar	Present	Present	Present	Absent	Absent
PH	7.2	7.4	7.4	7.4	7.4
Discolor ation on interior of can	Bad	Bad	Slight	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Dead	Normal	Dead	Dead	Dead
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

InspectionData.
First Inspection - Fall Pack, Sept. 29, 19 21.

Lot Number S.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number S 2.

Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data.
First Inspection - Fall Pack, Sept. 29, 1921.

Lot Number T.

	1 dot can.	2 dot can.
Growth on agar	Absent	Absent
PH	6.2	6.2
Discoloration on interior of can	None	None
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Normal	Normal
General appearance of pickle	Normal	Normal

Lot Number T 2.

Growth on agar	Absent	Absent
PH	6.2	6.2
Discoloration on interion of can	None	None
Discoloration of meat from interior discolorationof can	None	None
Discoloration of pickle from interior discoloration of can	None	None
Gene ral appearance of meat	Normal	Normal
General appearance of pickle	Normal	Normal

Inspection Data.
First Inspection - Fall Pack, Sept, 19 21.

Lot Number N 3.

Lacq. can.

Growth on agar	Absent
PH	6.4
Discoloration on interior of can	None
Discoloration of meat from interior discoloration of can	None - Nail - Bright
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Normal
General appearance of pickle	Normal

Lot Number N.4.

Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	None - Nail - black incrusted
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Slight discoloration
General appearance of meat	Normal

Inspection Data
First Inspection - Fall Pack, Sept. 28, 1921.

Lot Number Y.8.

	Lacq. can.
Growth on agar	Absent
PH	6.6
Discoloration on interior of can	None
Discoloration of meat from interior discoloration of can	None - No gasoline flavor or smell
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Normal
Gener al appearance of pickle	Normal

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Second

Inspection Data.

Experimental Fall Pack.

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Inspection Data.
Second Inspection, Fall Pack, Nov. 29 , 1921.

Lot Number B.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.6	6.6	6.6	6.6	6.6
Discoloration on interior of can	None	None	Trace	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number B1.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Present	Absent	Absent	Absent
PH	6.6	7.2	7.2	6.6	6.6
Discoloration on interior of can	Trace	Bad	Slight	Trace	Trace
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Slight discoloration	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data.
Second Inspection, Fall Pack. Nov. 29, 1921.

Lot Number C.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration of interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number C 1.

Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	None	Trace	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data.
Second Inspection, Fall Pack, Nov. 29, 1921.

Lot Number D.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number D2.

Growth on agar	Present	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	Trace	Trace	Trace	Trace
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data.
Second Inspection, Fall Pack, Nov. 29, 1921.

Lot Number E.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	Bad	Very bad	Very bad	Very bad	Very bad
Discoloration of meat from interior discoloration of can	Marked	Marked	Marked	Marked	Marked
Discoloration of pickle from interior discoloration of can	Slight	Slight	Slight	Slight	Slight
General appearance of meat	Marked discoloration	Marked discoloration	Marked discoloration	Marked discoloration	Marked discoloration
General appearance of pickle	Slight discoloration	Slight discoloration	Slight discoloration	Slight discoloration	Slight discoloration

Lot Number E.2.

Growth on agar	Absent	Present	Present	Absent	Absent
PH	7.4	7.2	7.4	7.4	7.4
Discoloration on interior of can	Bad	Bad	Bad	Bad	Bad
Discoloration of meat from interior discoloration of can	Marked	Marked	Marked	Marked	Marked
Discoloration of pickle from interior discoloration of can	Slight	Marked	Marked	Slight	Slight
General appearance of meat	Marked discoloration	Marked discoloration	Marked discoloration	Slight discoloration	Slight discoloration
General appearance of pickle	Slight discoloration	Marked discoloration	Marked discoloration	Marked discoloration	Marked discoloration

Inspection Data.

Second Inspection, Fall Pack, Nov. 29, 1921.

Lot Number N.

	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent
PH	6.6	6.6	6.6	6.6
Discoloration on interior of can	Slight	Slight	Slight	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Lot Number N 2.

Growth on agar	Present	Present	Absent	Absent
PH	6.6	6.6	6.6	6.6
Discoloration on interior of can	Slight	None	Trace	Trace
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Inspection Data,
Second Inspection, Fall Pack, Nov. 29, 1921.

Lot Number L

	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Lot Number L2.

	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Present	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2
Discoloration on interior of can	Trace	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Inspection Data.
Second Inspection, Fall Pack, Nov. 29, 1921.

Lot Number X.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.6	7.6	7.6	7.4
Discoloration on interior of can	Bad	Bad	Very Bad	Bad	Slight
Discoloration of meat from interior discoloration of can	Slight	Slight	Marked	Slight	Slight
Discoloration of pickle from interior discoloration of can	None	Slight	Slight	Normal	Normal
General appearance of meat	Slight discoloration	Slight discoloration	Marked discoloration	Slight discoloration	Slight discoloration
General appearance of picklev	Normal	Slight discoloration	Slight discoloration	Normal	Normal

Lot Number Xl.

Growth on agar	Present	Present	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	Bad	Slight	Bad	Slight	Bad
Discoloration of meat from interior discoloration of can	Slight	Slight	Slight	Slight	Slight
Discoloration of pickle from interior discoloration of can	Slight	Slight	Normal	Normal	Slight
General appearance of meat	Slight discoloration	Slight discoloration	Slight discoloration	Slight discoloration	Slight discoloration
General appearance of pickle	Slight discoloration	Slight discoloration	Normal	Normal	Slight discoloration

Inspection Data.
Second Inspection, Fall Pack, Nov. 29, 1921.

Lot Number S.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number S 2.

Growth on agar	Present	Present	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data
Second Inspection, Fall Pack, Nov. 29, 1921.

Lot Number T.

	Lacq. can.	1 dot can.
Growth on agar	Absent	Absent
PH	6.2	6.2
Discoloration on interior of can	None	None
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Normal	Normal
General appearance of pickle	Normal	Normal

Lot Number T 2.

Growth on agar	Absent	Absent
PH	6.2	6.2
Discoloration on interior of can	None	None
Discoloration of meat from interior discoloration of can	None	None
Discoloration of pickle from interior discoloration of can	None	None
General appearance of meat	Normal	Normal
General appearance of pickle	Normal	Normal

Inspection Data.
Second Inspection, Fall Pack, Nov. 29, 1921.

Lot Number N3.

	Lacq. can.
Growth on agar	Absent
PH	6.4
Discoloration on interior of can	None
Discoloration of meat from interior discoloration of can	None - nail bright
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Normal
General appearance of pickle	Normal

Lot Number N4.

Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	None - Nail black incrusted
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Slight discoloration
General appearance of pickle	Normal

Inspection Data.
Second Inspection, Fall Pack, Nov. 29, 1921.

Lot Number Y8.

	Laeq. can.
Growth on agar	Absent
PH	6.6
Discoloration on interior of can	None
Discoloration of meat from interior discoloration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Normal
General appearance of pickle	Normal

Third

Inspection Data.

Experimental Fall Pack.

Inspection Data.

Third Inspection Data - Fall Pack, Feb. 22, 1922.

Lot Number B.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Growth	Absent
PH	6.6	6.6	6.6	7.0	6.6
Discoloration on interior of can	None	Trace	Slight	Slight	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Slight discoloration	Slight discoloration	Normal
General appearance of pickle	Normal	Normal	Normal	Turbid	Normal

Lot Number B 1.

Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.2	7.2	6.8	6.6	6.6
Discoloration on interior of can	Slight	Slight	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Slight discoloration	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data.
Third Insepection, Fall Pack, February 16, 1922.

Lot Number C.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Present	Absent	Absent	Absent
PH	6.2	7.2	6.2	6.2	6.2
Discoloration on interior of can	None	Bad	None	None	Nine
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Marked discoloration	Normal	Normal	Normal
General appearance of pickle	Normal	Turbid	Normal	Normal	Normal

Lot Number C 1.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Present	Present	Absent	Absent
PH	6.2	6.6	6.4	6.2	6.2
Discoloration on interior of can	Trace	Bad	Bad	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Marked discoloration	Marked discoloration	Normal	Normal
General appearance of pickle	Normal	Turbid	Turbid	Normal	Normal

Inspection Data.
Third Inspection - Fall Pack, Feb. 22, 1922.

Lot Number D.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	Slight	None	Trace	Slight
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number D2.

Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	Trace	Trace	Trace	Trace
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Slight	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data.
Third Inspection, Fall Pack, Feb. 22nd, 1922.

Lot Number E.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	Bad	Slight	Bad	Very bad	Bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Marked discoloration	Slight discoloration	Slight discoloration	Marked discoloration	Marked discoloration
General appearance of pickle	Slight discoloration	Normal	Normal	Slight discoloration	Slight discoloration

Lot Number E2.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	Bad	Slight	Bad	Very bad	Bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Marked discoloration	Marked discoloration	Marked discoloration	Marked discoloration	Marked discoloration
General appearance of pickle	Slight discoloration	Slight discoloration	Slight discoloration	Normal	Slight discoloration

Inspection Data.
Third Inspection - Fall Pack, Feb. 22nd, 1922.

Lot Number N.

	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent
PH	6.6	6.6	6.6	6.6
Discoloration on interior of can	Slight	Bad	Slight	Trace
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Paper - brown stained

Lot Number N 2.

Growth on agar	Absent	Absent	Absent	Absent
PH	6.6	6.6	6.6	6.6
Discoloration on interior of can	Slight	Slight	Trace	Trace
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Paper - brown stained

Inspection Data
Third Inspection - Fall pack, Feb. 22, 1922.

Lot Number L.

	1 dot can.	2 dot can.	3 dot can.	4 dot can.
Growth on agar	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2
Discoloration on interior of can	Trace	Trace	Trace	None
Discoloration of meat from interior discol-oration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Lot Number L 2.

Growth on agar	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2
Discoloration on interior of can	Slight	None	Trace	None
Discoloration of meat from interior discoloration of can	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal

Inspection Data
Third Inspection, Fall Pack, Feb. 22, 1922.

Lot Number X.

	Lacq. can.	I dot can.	2 dot can.	3 dot can.	4 dot can
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.2	7.4	7.4
Discoloration on interior of can	Bad	Slight	Slight	Bad	Bad
Discoloration of meat from interior discoloration of can	NOne	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Slight discolor.	Slight discolor.	Slight discolor.	Slight discolor.	Slight discolor.
General appearance of pickle	Normal	Normal	Turbid	Turbid	Turbid

Lot Number XI.

Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	7.4	7.4	7.4	7.4	7.4
Discoloration on interior of can	Bad	Bad	Bad	Bad	Bad
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Slight discolor.	Slight discolor.	Marked discolor.	Marked discolor.	Slight discolor.
General appearance of pickle	Normal	Normal	Normal	Normal	Normal.

Inspection Data
Third Inspection - Fall Pack, Feb. 22nd, 1922.

Lot Number S.

	Lacq. can.	1 dot can.	2 dot can.	3 dot can.	4 dot can
Growth on agar	Absent	Absent	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	None	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Lot Number S 5.

Growth on agar	Absent	Present	Absent	Absent	Absent
PH	6.2	6.2	6.2	6.2	6.2
Discoloration on interior of can	None	Bad	None	None	None
Discoloration of meat from interior discoloration of can	None	None	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None	None	None
General appearance of meat	Normal	Normal	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal	Normal	Normal

Inspection Data
Third Inspection - Fall Pick Feb. 22, 1922.

Lot Number T.

	1 dot can.	2 dot can.	3 dot can.
Growth on agar	Absent	Absent	Absent
PH	6.2	6.2	6.2
Discoloration on interior of can ≠	Galv.	Galv.	Galv.
Discoloration of meat from interior discoloration of can	None	None	None
Discoloration of pickle from interior discoloraion of can	None	None	None
General appearance of meat	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal

≠ Appearance of can galvanized - not black

Lot Number T2.

Growth on agar	Absent	Absent	Absent
PH	6.2	6.2	6.2
Discoloration on interior of can	Galv.	Galv.	Galv.
Discoloration of meat from interior discoloration of can	None	None	None
Discoloration of pickle from interior discoloration of can	None	None	None
General appearance of meat	Normal	Normal	Normal
General appearance of pickle	Normal	Normal	Normal

≠ Appearance of can galvanized - not black

Inspection Data
Third Inspection- Fall Pack Feb. 22, 1922.

Lot Number N3.

	Lacq. can.
Growth on agar	Absent
PH	6.4
Discoloration on intrior of can	None
Discoloration of meat from interior discoloration of can	None - Nail bright
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Normal
General appearance of pickle	Normal

Lot Number N4.

Growth on agar	Absent
PH	7.4
Discoloration on interior of can	Bad
Discoloration of meat from interior discoloration of can	None - Nail black, incrusted
Discoloration of pickle from interior discoloration of can	None
General appearance of meat	Slight discoloration
General appearance of pickle	Normal

Inspection Data.
Third Inspection - Fall Pack, Feb. 22, 1922.

Lot Number Y 8.

	Lacq. can.
Growth on agar	Absent
PH	6.6
Discoloration on in terior of can	None
Discoloration of meat from interior discol- oration of can	None
Discoloration of pickle from interior discoloration of can	None
General appearan ce of meat	Normal
General appearance of pickle	Normal

SUMMARY OF FALL EXPERIMENTAL DATA.

1. As in 1, 2 and 3 of the spring experimental data.

2. An average of the three inspections with adjusted PH 6.6 to 6.2 prevents discoloration of the meat in 98 percent of the cans, with 2 percent only slightly discolored. All cans are marketable.

3. An average of the three inspections with normal fall pack lobsters PH 6.6 - 6.8 show meat discoloration as follows:- No discoloration 82 percent, slight discoloration 4 percent, marked discoloration 14 percent.

4. An average of the three inspections with adjusted PH 6.6 to 6.2 prevents discoloration of the can interior in 83 percent of the cans, 13 percent show only a trace and 4 percent slight.

5. An average of the three inspections with a normal PH 6.6 to 6.8 shows discoloration of the can interior as follows:- No discoloration 43 percent, trace 19 percent, slight 30 percent, bad 8 percent.

6. After six months storage, normal fall pack lobsters PH 6.6 show chemical discoloration of the meat as follows:- No discoloration 82 percent, slight discoloration 18 percent. Fall pack lobsters with PH adjusted to 6.2 show chemical discoloration of the meat as follows:- No discoloration 98 percent, slight discoloration 2 percent.

7. After six months storage normal fall pack lobsters PH 6.6 to 6.8 show chemical discoloration of the can interior as follows:- No discoloration 34 percent, trace I6 percent, slight discoloration 40 percent, bad IO percent. Fall pack lobsters with PH adjusted to 6.2 show chemical discoloration of the can interior as follows:- No discoloration 67 percent, slight 24 percent, marked discoloration 9 percent.

8. An average of the three inspections with an adjusted PH 7.4 show discoloration of the meat as follows:- No discoloration 3 percent, slight discoloration 60 percent, marked discoloration 37 percent. The can interior is as follows:- No discoloration 0 percent, trace 4 percent, slight I8 percent, bad 62 percent, very bad I6 percent.

9. The use of acetic and citric acid in adjusting the PH of the can is highly satisfactory, as a preventive for meat and can discoloration.

IO. The degree of discoloration in the meat and cans of fall pack lobsters is much less than in the spring.

II. The PH of the fall pack lobster is 6.6 to 6.8 while that of the spring pack is 7.6.

I2. Spore forming bacteria added to the fall pack lobster cans survive the continuous method of sterilization, but are killed at 240^{o}F for 30 minutes in a 4 ounce can.

SUMMARY.

I. All theories advanced by lobster packers as to the cause of discoloration have been investigated by experimental methods. The results of experiments show that many of these "pet theories" are in no way responsible for discoloration. A number, however, were suggestive and have helped in the solution of the problem.

2. The various forms of discoloration are classified as follows:-

I. Chemical.

(a) Inky black discoloration of can interior.

(b) Inky black discoloration of the meat.

(c) Black discoloration of the paper lining.

(d) Brown discoloration of the paper lining.

(e) Inky black discoloration of the pickle.

(f) Brown incrustation of the can interior.

2. Bacterial.

(a) Inky black discoloration of the meat.

(b) Blueing of the meat.

(c) Dull yellowish white of the meat.

(d) Varied, other than above.

3. Results of experimental data have led to certain definite scientific results of the causes and prevention of discoloration.

4. The use of heavy tin plate does not prevent the formation of discoloration.

5. Discoloration of the can interior can only be prevented by other means.

6. The enamel or lacquer lined can shows no improvement over the plane sanitary tin can.

7. Discoloration occurs as widely in the acid flux can as in the sanitary can.

8. The use of acetic and citric acid in adjusting the PH prevents can and meat discoloration so that all cans are marketable.

9. The meat of adjusted spring and fall pack lobsters is all of marketable quality.

10. Fall pack lobsters adjusted from PH 6.6 to PH 7.4 resemble spring pack lobsters in amount of can and meat discoloration.

11. Acetic and citric acid have given equally satisfactory results. The use of citric acid is preferable commercially for its convenience of handling. On the other hand, the use of acetic acid does not require a declaration by the Pure Food Laws.

12. The PH of spring pack lobsters is 7.6 while the fall is 6.6 to 6.8. This difference is highly significant and accounts for the wide variation in the degree of discoloration between the spring and fall pack. Previous to this

investigation no experimenter has ever noted the difference between the PH of the spring and the fall packs. A change in PH from alkaline to acid occurs only during the molting season, which continues throughout the fall packing season. An explanation is found in this change by the absorption of lime from the cast off shell, which is changed in the stomach to acid phosphates, and thence carried by the blood to the locality where they are used.

13. Pyridine, unknown to be present, has been isolated from canned lobsters.

14. The presence of pyridine in canned lobsters explains the corrosive action of an alkaline food on the container. The basic properties of pyridine dissolves tin plate slowly, assists in the exposure of iron and finally in the formation of iron sulphide.

15. The quality of the meat in the parchment lined cans is improved as well as the general appearance of the meat.

16. The use of parchment linings is recommended.

17. Discoloration increases with delay in handling and packing meat, especially in warm weather.

18. The canning of dead lobsters produces typical discoloration.

19. The present method of continuous sterilization at 212°F. is not recommended, as a result of the experimental data.

20. Discoloration is not influenced by salt or fresh water pickle.

21. Where lobster blood is not carefully washed from the meat, blue black discoloration is present.

22. Tight seams are necessary with lobster cans to avoid air and rust discoloration which accelerate the formation of black iron sulphide.

23. Hydrogen sulphide is not of prime importance inthe production of chemical discoloration, but is influenced by the hydrogen ion concentration.

24. Discoloration is not prevented by exhausting the can.

25. Discoloration by bacteria after sterilization is a minor factor in the present investigation, but, commercially, it may be of greater importance in many factories with faulty equipment and handling.

26. About 80 percent of the discoloration is chemical.

27. About 20 percent of the discoloration is due to bacterial changes previous to canning, understerilization and leaks.

28. By the use of exhaust, linings and an adjusted PH, 98 percent of all experimental canned lobsters were marketable, which was an improvement of 60 percent over the commercial pack.

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